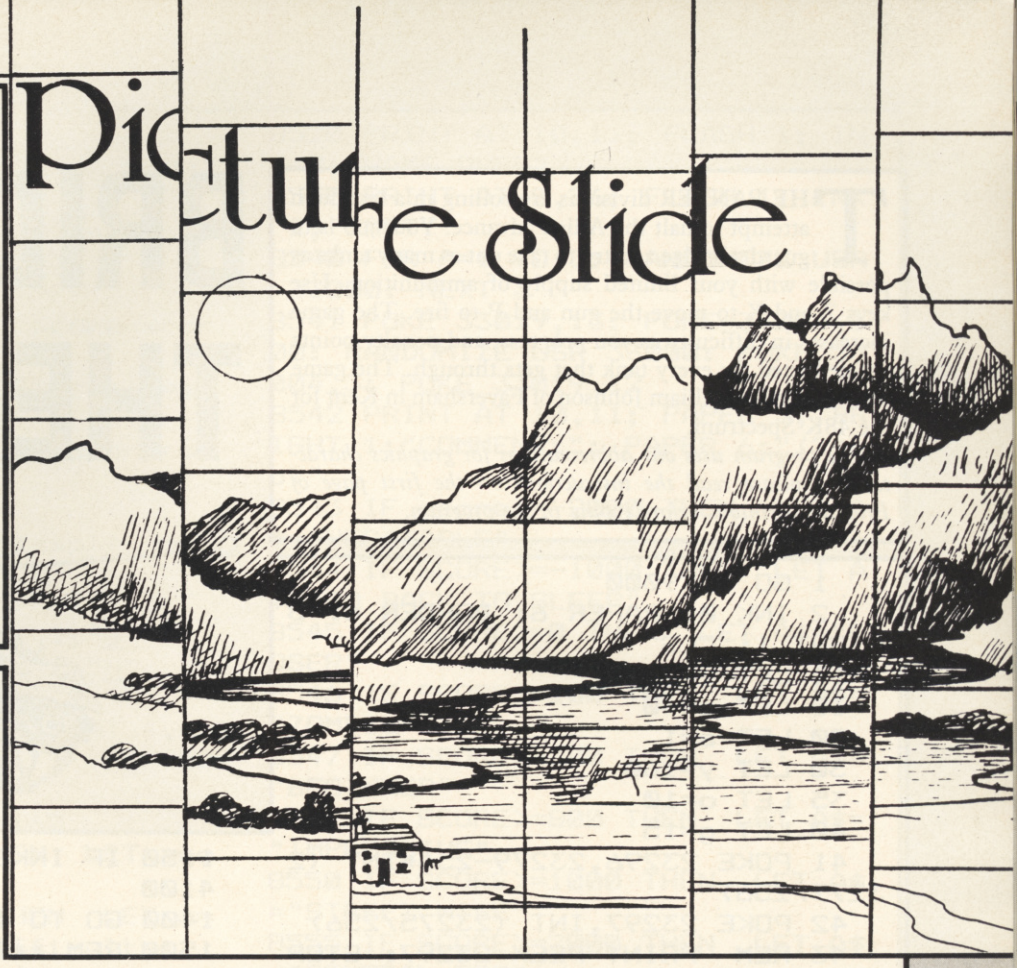
Picture Slide



A VARIATION on those sliding block puzzles you find in Christmas stockings, **Picture Slide** uses an impressive machine-code routine to swap areas of the screen display. Written by Pete Cooke of Leicester for the 16K Spectrum, it uses a simple picture located at lines 8210–8240. If you want you can adapt the program at those lines to draw your own picture, or even use a professional draw program to create a picture.

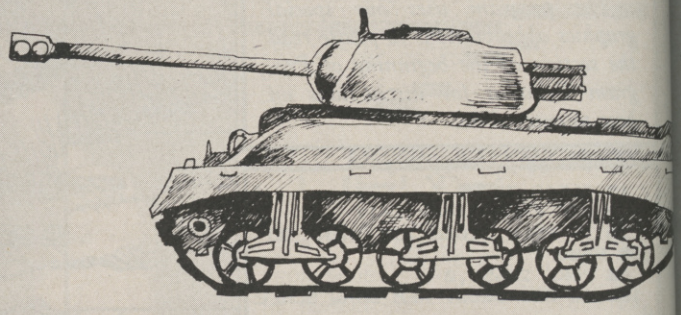
The program uses our special graphics abbreviations so please read the section at the beginning of Program Printout for instructions on how to enter these.

```
 10 CLEAR 30999
 20 DEF FN A(X)=8*(X+1)
 30 IF PEEK 31000<>33 THEN  GO
SUB 9500
 40 POKE 23658,0
100 GO SUB 8000: REM DRAW SCREE
N
105 PAPER 7
110 GO SUB 2000: REM SHUFFLE
120 LET move=1
1000 PRINT #1;AT 0,0; PAPER 7;"P
RESS ARROWS TO MOVE . MOVE ";MOV
E;AT 1,0;"(5*sp)*** Press q to q
uit ***"
1020 LET Z$=INKEY$: IF Z$<>"q" A
ND (z$<"5" OR z$>"8") THEN  GO T
O 1020
1030 IF z$="q" THEN  GO TO 1100
1040 GO SUB 1500: LET move=move+
1: GO TO 1000
1100 INPUT "": PRINT #1;AT 0,0;
PAPER 6;"**** Stopped ****(2*sp)
Press ENTER(2*sp)to try again, R
 to reshuffle.(3*sp)";
1110 IF INKEY$<>"" THEN  GO TO 1
110
1120 LET z$=INKEY$: IF z$<>CHR$
13 AND z$<>"r" THEN  GO TO 1120
1130 IF z$="r" THEN  GO SUB 2000
: GO TO 1000
1140 RUN
1500 IF z$="8" AND x-(y=4)>3 THE
N  BEEP .1,12: RETURN : REM X=5
Y=4
1510 IF z$=("5" AND x=0) OR (z$=
"7" AND y=0) OR (z$="6" AND y=4)
 THEN  BEEP .1,12: RETURN
1520 IF x=5 AND z$<>"5" THEN  BE
EP .1,12: RETURN
1530 LET a=x-(z$="5")+(z$="8"):
LET b=y-(z$="7")+(z$="6")
1540 GO SUB 3000: RETURN
1999 STOP
2000 INPUT "How many swops (0 TO
 200) ";swops: IF swops<0 OR swo
ps>200 THEN  GO TO 2000
2010 FOR n=1 TO 6: LET z$="55577
7"(n): GO SUB 1500: NEXT n
2020 FOR n=1 TO swops: LET z$="5
678"(INT (1+RND*4)): GO SUB 1500
: NEXT n
2030 RETURN
3000 REM *** SWOP X,Y WITH A,B *
**
3010 POKE 31001,32*A+8: POKE 310
02,32*B+8: POKE 31004,32*X+8: PO
KE 31005,32*Y+8
3020 LET X=A: LET Y=B: REM  EMPT
Y SQUARE
3030 LET V=USR 31000
3040 RETURN
8000 REM ** SET UP THE SCREEN **
8010 PAPER 7: INK 0: BORDER 7: C
LS : PRINT AT 0,0;"(ig4,20*g3,g7
)"
8020 FOR N=1 TO 15: PRINT AT N,0
;"(ig5)";TAB 21;"(g5)": NEXT N
8030 PRINT AT 16,0;"(ig5)";TAB 2
1;"(g1,3*g3,g7)"
8040 FOR N=17 TO 20: PRINT AT N,
0;"(ig5)";TAB 21;"(4*sp,g5)": NE
XT N
8090 PRINT "(ig1,24*ig3,ig2)"
8100 LET X=5: LET Y=4
8110 PRINT AT 0,23; PAPER 1; INK
 7; BRIGHT 1;"(9*sp)";AT 1,23;"
Sliding ";AT 2,23;" Block(3*sp)"
;AT 3,23;" Puzzle(2*sp)";AT 4,23
;"(9*sp)"
8120 PRINT AT 6,23; PAPER 6;" P.
Cooke ";AT 7,23;" May 84(2*sp)"
8130 REM
8200 REM

   ** PUT YOUR DESIGN HERE **

8210 FOR n=1 TO 20: PRINT AT n,1
; PAPER (6-(n<6));"(20*sp)": NEX
T n
8220 INK 1: FOR n=20 TO 80 STEP
2: PLOT n,20: DRAW 0,n: NEXT n
8230 INK 2: FOR n=20 TO 80 STEP
2: PLOT n+76,20: DRAW 0,100-n: N
EXT n
8240 INK 8: FOR n=10 TO 30: CIRC
LE 88,90+n,n: NEXT n
8250 PAPER 4: INK 0: PRINT AT 18
,2;"(2*sp)Puzzle this out ";AT 1
9,2;"(3*sp)If you can !!(2*sp)"
8260 INK 3: FOR n=40 TO 136 STEP
 96: FOR m=-15 TO 15: PLOT n,90:
 DRAW m,55: NEXT m: NEXT n
8270 INK 2: FOR n=40 TO 136 STEP
 96: FOR m=-15 TO 15: PLOT n,70:
 DRAW m,15: NEXT m: NEXT n
8280 PRINT AT 1,3; PAPER 7; INK
1;"OOOOOOOOOOOOOOO";AT 1,3; OVE
R 1;"(4*ig3)/\/\/\/\(4*ig3)"
8290 PRINT AT 2,3; PAPER 2; INK
7;"<><><><><><><><>"
8300 RETURN
8900 STOP
9000 DATA 33,168,136,1,136,136,3
4,246,121,237
9010 DATA 67,248,121,34,250,121,
237,67,252,121
9020 DATA 62,32,50,254,121,237,7
5,250,121,205
9030 DATA 172,121,4,237,67,250,1
21,229,237,75
9040 DATA 252,121,205,172,121,4,
237,67,252,121
9050 DATA 209,6,4,26,119,62,0,18
,35,19
9060 DATA 16,247,58,254,121,214,
1,50,254,121
9070 DATA 32,209,237,75,246,121,
237,67,250,121
9080 DATA 237,75,248,121,237,67,
252,121,62,4
9090 DATA 50,254,121,237,75,250,
121,205,220,121
9100 DATA 120,198,8,71,237,67,25
0,121,229,237
9110 DATA 75,252,121,205,220,121
,120,198,8,71
9120 DATA 237,67,252,121,209,6,4
,26,119,58
9130 DATA 141,92,18,19,35,16,246
,58,254,121
9140 DATA 214,1,50,254,121,32,20
2,201,62,191
9150 DATA 144,216,120,245,230,56
,38,16,111,41
9160 DATA 41,241,245,230,192,203
,63,203,63,203
9170 DATA 63,132,103,241,230,7,1
32,103,121,230
9180 DATA 7,87,121,203,63,203,63
,203,63,133
9190 DATA 111,124,206,0,103,201,
120,230,248,111
9200 DATA 38,22,41,41,121,230,7,
87,121,203
9210 DATA 63,203,63,203,63,133,1
11,62,0,132
9220 DATA 103,201
9500 CLS : PRINT AT 5,3;"Poking
in machine code.";AT 7,9;"Please
 wait."
9510 LET total=0: RESTORE 9000:
FOR n=31000 TO 31221: READ a: LE
T total=total+a: POKE n,a
9520 NEXT n
9530 IF total<>29212 THEN  PRINT
 '''"Data error ... do not RUN":
STOP
9540 RETURN
```

BRIDGE ON THE RHINE

THE PANZER divisions are rolling in a last-ditch attempt to halt the Allied advance. Your job is to guard a bridge and try to take out as many tanks as possible with your limited supply of ammunition. Use keys Z and X to move the gun and P to fire. The game increases in difficulty as you progress, and penalty points are deducted for every tank that gets through. The game was written by William Johnson of Faversham in Kent for the 48K Spectrum.

The program uses our abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the program.

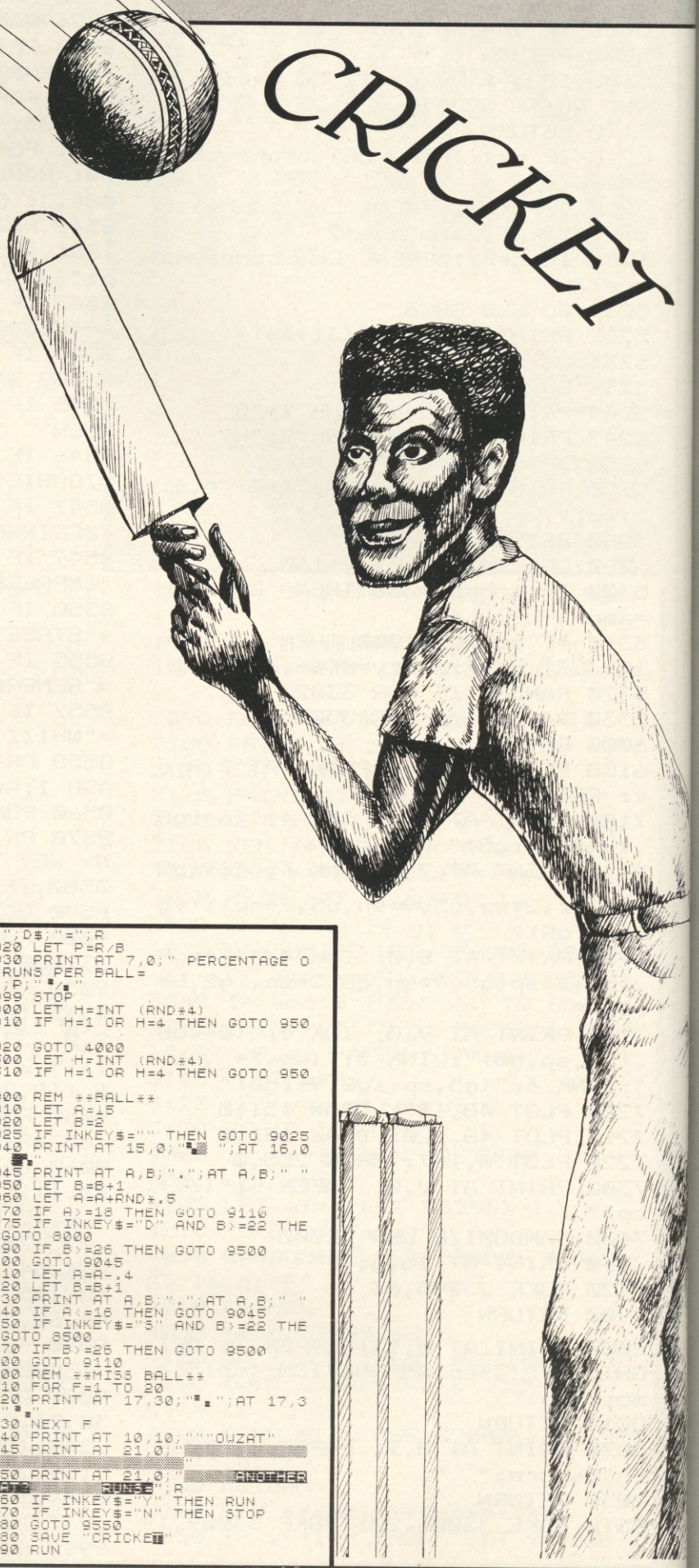


```
    1 GO TO 9000
    2 INK 0: PAPER 6: BORDER 6: B
RIGHT 1: CLS
   10 LET x=29
   15 LET cx=0
   20 LET a=1
   30 LET y=160
   35 LET o=10
   40 LET g=15
   41 POKE 23296,23279-256*INT (2
3277/256)
   42 POKE 23297,INT (23275/256)
   43 REM  PRINT PEEK 23297: STOP

   50 LET score=0
   55 LET speed=1
   60 LET amo=20
   65 LET difficulty=1.8
   70 LET s=1
   75 POKE 23658,0
   80 GO SUB 7000
   85 GO SUB 8000: GO SUB 8020
   90 REM **END OF VARIABLES**
  100 GO TO 1000
  500 REM ****TANK MOVE********
  505 IF x<1 THEN  PRINT AT 5,0;"
(3*sp)": LET score=score-100: GO
 SUB 8020: GO SUB 6100: LET x=29
: RETURN
  670 IF s=1 THEN  GO TO 2100
  675 IF s=0 THEN  GO TO 2120
  680 RETURN
  900 REM **END OF TANK MOVE***
 1000 REM **MAIN LOOP********
 1010 IF INT (RND*o)=1 THEN  LET
speed=0
 1100 IF speed=1 THEN  GO SUB 500
 1110 IF INT (RND*5)=1 THEN  LET
speed=1
 1121 GO SUB 5000
 1125 PLOT  INVERSE 1;g*8,y+diffi
culty
 1130 IF y<160 THEN  GO SUB 3090
 1131 IF INKEY$="p" THEN  GO TO 3
000
 1145 IF INKEY$="z" THEN  GO SUB
 4000
 1150 IF INKEY$="x" THEN  GO SUB
 4100
 1400 GO TO 1000
 1500 REM **END OF MAIN LOOP*****
*
 2090 REM ***TANK PRINT*******
 2100 PRINT AT 5,x;"AB(sp)"
 2110 LET s=0: RETURN
 2120 PRINT AT 5,x-1; "CDE(sp)"
 2130 LET x=x-1: LET s=1: RETURN
 2160 REM ****END OF TANK PRINT:
 3000 REM ***BOM DROP**********
 3010 PRINT AT 15,g;"G"
 3020 PRINT AT 14,g;"H"
 3030 RANDOMIZE USR 33000: BORDER
  6: LET amo=amo-1: GO SUB 8000
 3040 IF amo<0 THEN  GO TO 8500
 3080 PRINT AT 15,g; PAPER 6;"(sp
)";AT 14,g; PAPER 6;"(sp)"
 3110 PLOT g*8,y
 3120 LET y=y-difficulty
 3130 GO TO 1170
 4000 IF g<=0 THEN  RETURN
 4001 LET g=g-1
 4005 LET af=(PEEK 23296)-1
 4010 POKE 23296,af
 4030 RANDOMIZE USR 32000: PRINT
AT 16,g;"F"
 4040 RETURN
 4050 POKE 23295,63
 4100 IF g>=31 THEN  RETURN
 4105 POKE 23296,(PEEK 23296)+1
 4110 LET g=g+1
 4120 RANDOMIZE USR 32000: PRINT
AT 16,g;"F"
 4500 RETURN
 5000 REM ***HIT?***********
 5050 IF y<=128 THEN  LET y=160:
```

```
GO SUB 5240
5060 IF y<=134 THEN  GO TO 5100
5070 RETURN
5100 IF g=X OR g=x+1 OR g=x+2 TH
EN  GO TO 5200
5110 RETURN
5210 IF g=x THEN  LET score=scor
e+100
5220 IF g=x+2 THEN  LET score=sc
ore+50: LET amo=amo+2
5230 IF g=x+1 THEN  LET score=sc
ore+75
5231 GO SUB 8020
5232 PRINT AT 5,0;"(31*sp)"
5233 GO SUB 5240
5234 GO TO 5290
5245 PRINT AT 5,g; INK 2;"G"
5247 PRINT AT 4,g; INK 2;"H"
5250 BEEP .1,-50
5270 PRINT AT 5,g;"(sp)";AT 4,g;
"(sp)"
5280 RETURN
5290 LET x=29: LET y=160
5300 IF score>=300 THEN  LET amo
=amo+1
5310 IF score>=1000 THEN  LET o=
15: LET difficulty=difficulty+1
5320 RANDOMIZE USR 33023
5330 RANDOMIZE USR 33023
6000 RETURN
6100 LET cx=cx+1: PRINT AT 7,0;c
x: RETURN
7100 PRINT AT 6,0; INK 4;"(6*ig8
,19*#,7*ig8)"
7110 PRINT AT 7,0; INK 4;"(6*ig8
,ig1)/(2*sp,g5,9*sp,g5,2*sp)\(ig
2,7*ig8)"
7130 PRINT AT 8,0; INK 4;"(7*ig8
,ig1,2*sp,g5,9*sp,g5,2*sp,ig2,8*
ig8)"
7140 PRINT AT 9,0; INK 4;"(8*ig8
,ig1,sp,g5)"; INK 5;"(sp,7*_,sp)
"; INK 4;"(g5,sp,ig2,9*ig8)"
7200 PLOT 48,127: DRAW 151,0
7210 PLOT 48,120: DRAW 151,0
7220 PLOT 0,167: DRAW 255,0
7300 PRINT AT 0,0; PAPER 3;"(32*
sp)"
7400 RANDOMIZE USR 32000
7410 PRINT AT 16,g;"F"
7420 POKE 23295,63
7900 RETURN
8000 PRINT AT 0,13; PAPER 3; BRI
GHT 1;;"(3*sp)AMMUNITION:(sp)";a
mo;"(sp)"
8010 RETURN
8020 PRINT AT 0,2; PAPER 3;"SCOR
E=";score;"  "
8030 RETURN
8510 POKE 33006,20: POKE 33009,1
8
8520 PRINT AT 10,11; FLASH 1; IN
K 2;"GAME OVER"
8530 PRINT AT 0,26; FLASH 1; INK
 2;"EMPTY"
8540 FOR A=1 TO 3: RANDOMIZE USR
 33000: NEXT a
8541 POKE 33019,13: POKE 33004,1
00: RANDOMIZE USR 33000: POKE 33
004,3: POKE 33019,12
8542 PRINT AT 10,11; PAPER 3; BR
IGHT 1;"COMMENT:"; PAPER 6;"(2*s
p)"
8543 IF score>=-2000 THEN  LET A
$="VEGATABLE"
8544 IF SCORE>=-1000 THEN  LET A
$="GO BACK TO SLEEP"
8545 IF SCORE>=0 THEN  LET A$="L
OSER"
8546 IF SCORE>=100 THEN  LET A$=
"ZOMBIE"
8547 IF SCORE>=300 THEN  LET A$=
"BEGINNER"
8549 IF SCORE>=800 THEN  LET A$=
"IMPRESSIVE"
8550 IF SCORE>=1000 THEN  LET A$
="STREET WISE"
8555 IF SCORE>=2000 THEN  LET A$
="GENERAL PRO"
8557 IF SCORE>=5000 THEN  LET A$
="WHIZZ KID"
8558 PRINT AT 12,11; PAPER 3; FL
ASH 1;A$
8560 POKE 33006,2: POKE 33009,24
8570 PRINT AT 0,0;"(5*sp)PRESS A
NY KEY TO PLAY(6*sp)"
8580 IF INKEY$<>"" THEN  RUN 2
8590 GO TO 8580
9000 FOR z=0 TO 38: READ a: POKE
 32000+z,a: NEXT z
9030 DATA 33,0,90,6,255,62,63,11
9,35,16,252,42,0,91,62,0,119,1,3
2,0,237,66,119,237,66,119,237,66
,119,237,66,119,237,66,119,237,6
6,119,201
9050 FOR a=0 TO 63: READ z: POKE
 65368+a,z: NEXT a
9060 DATA 0,255,7,1,127,255,170,
85,112,254,254,248,254,255,170,8
4,0,15,0,0,7,15,5,2,7,255,255,63
,255,255,85,170,0,192,192,0,192,
224,64,128,255,165,165,165,165,1
65,165,126,149,215,90,93,107,50,
46,60,129,36,1,138,36,38,88,42
9070 FOR A=0 TO 48: READ X: POKE
 33000+A,X: NEXT A
9080 DATA 33,0,0,14,3,22,2,126,2
30,24,211,254,65,16,254,35,21,32
,244,12;32,239,201,33,0,64,126,7
,119,21,35,124,254,88,32,246,33,
0,64,126,15,119,35,124,254,88,32
,247,201
9999 GO TO 2
```

CRICKET

GET SOME practice in the nets with **Cricket** for the 16K ZX-81. You decide how many bowls you want to receive and then press 0 to bowl and D to strike the ball. The computer will then show you how many runs you have scored. The full score is given at the end of the game or when you are bowled out. Cricket was written by Mark White of Redditch in Worcestershire.



```
   2 LET BA=0
   3 GOSUB 5000
   4 LET R=0
   5 CLS
   6 LET BA=BA+1
   7 IF BA>BO THEN GOTO 6000
  10 PRINT AT 15,0;"  ▗";AT 16,0
;"                 ";AT 17,
0;"                 ";AT 18,
0;"                 "
  20 PRINT "▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒
```

Wally meets the Things

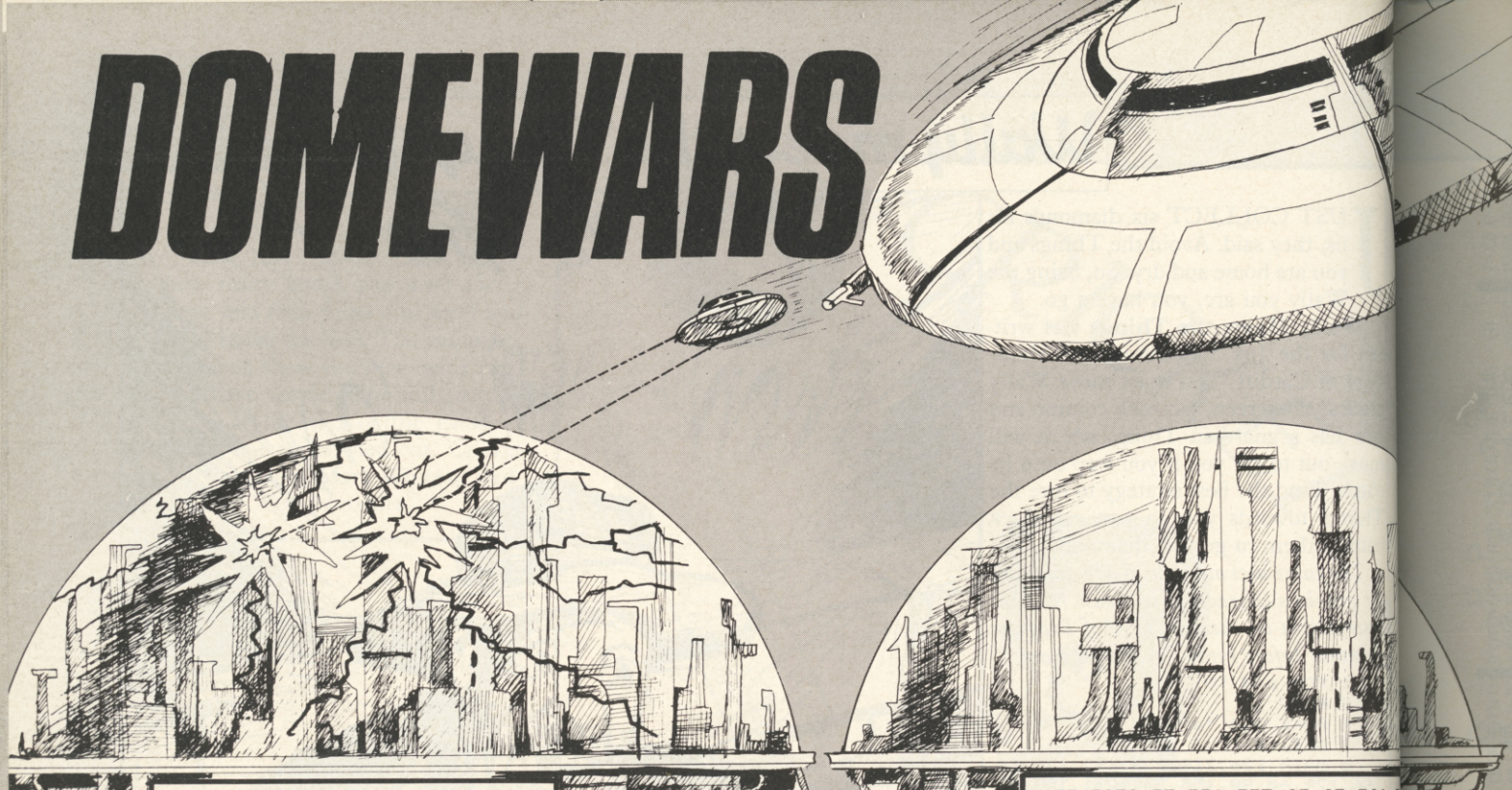
JUST COLLECT six diamonds for us, they said. Avoid the Things and you are home and dry. So, being the Wally you are, you have a go.

Wally Meets the Things was written for the 16k Spectrum by P Mansfield of Cardiff. You must move Wally around the screen, but each column and row has a guardian Thing, which will move out to get you if you step onto its patch. Find the best strategy to lure the Things towards you so you can duck behind them to get the diamonds.

The game uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the program.

```
  1 FOR i=0 TO 23
  2 READ j
  3 POKE USR "a"+i,j
  4 NEXT i
  5 DATA 126,219,255,195,126,66
,66,129,60,90,153,231,231,153,90
,60,24,24,8,126,8,24,36,66
  6 PRINT  FLASH 1; INK 4;AT 0,
5;"GET READY"
  7 PRINT  PAPER 1; INK 7;"USE
CURSOR KEYS TO MOVE MAN -(3*sp)W
ALLY HAS TO AVOID THE THINGYS(2*
sp)AND COLLECT(2*sp)SIX DIAMONDS
 TO WIN -THE THINGYS ARE DEADLY
AND SO(2*sp)ARE THE RED AND BLUE
 BORDERS(3*sp)"
  8 BORDER 3
  9 PAUSE 200
 10 CLS
 11 PLOT 0,7: DRAW 248,0: DRAW
0,167
 15 PAPER 7: INK 0
 20 DIM a(20)
 25 DIM b(30)
 35 LET w$="(sp)": LET k=0: LET
t=0
 40 LET x=1
 50 FOR y=1 TO 30
 60 PRINT  INK 2;AT x,y;"A"
 70 LET b(y)=1
 80 NEXT y
 90 LET y=1
100 FOR x=1 TO 20
110 PRINT  INK 1;AT x,y;"A"
120 LET a(x)=1
130 NEXT x
135 LET c=20: LET d=30
140 PRINT  INK 3;AT c,d;"C"
150 PRINT  INK 1;AT 0,0;"(31*g3
)"
155 PRINT  INK 2;AT 0,0;"(ig4)"
160 FOR p=1 TO 20
170 PRINT  INK 2;AT p,0;"(ig5)"
175 NEXT p
176  PRINT  PAPER 6; INK 2;AT 0
,1;"B"
177  PRINT  PAPER 6; INK 2;AT 0
,15;"B"
178  PRINT  PAPER 6; INK 2;AT 0
,30;"B"
179  PRINT  PAPER 6; INK 2;AT 6
,0;"B"
180  PRINT  PAPER 6; INK 2;AT 1
3,0;"B"
181  PRINT  PAPER 6; INK 2;AT 2
0,0;"B"
183 FOR u=1 TO 5
185 BEEP .05,20: BEEP .05,22: B
EEP .05,25: BEEP .05,30
187 NEXT u
190 REM move man
200 GO SUB 300
210 REM move red down
213 IF d=0 THEN  GO TO 225
215 IF a(b(d))=d THEN  LET w$="
A": LET k=1
220 GO SUB 400
223 LET w$="(sp)": LET k=0
225 REM move man
230 GO SUB 300
235 REM move blue across
236 IF c=0 THEN  GO TO 190
237 IF b(a(c))=c THEN  LET w$="
A": LET k=2
240 GO SUB 420
245 LET w$="(sp)": LET k=0
250 GO TO 190
290 REM move man
300 PRINT AT c,d;"(sp)"
310 LET d=d-(INKEY$="5" AND d>0
)+(INKEY$="8" AND d<30)
320 LET c=c-(INKEY$="7" AND c>0
)+(INKEY$="6" AND c<20)
330 IF ATTR (c,d)=57 OR ATTR (c
,d)=58 THEN  GO TO 1000
335 IF ATTR (c,d)=50 THEN  LET
t=t+1: BEEP .05,10
340 PRINT  INK 3;AT c,d;"C"
342 IF t=6 THEN  GO TO 700
343 BEEP .01,-20
350 RETURN
395 REM move red down
400 IF b(d)<c THEN  PRINT  INK
k;AT b(d),d;w$: LET b(d)=b(d)+1:
 GO SUB 500
410 IF b(d)>c THEN  PRINT  INK
k;AT b(d),d;w$: LET b(d)=b(d)-1:
 GO SUB 500
415 RETURN
417 REM move blue across
420 IF a(c)<d THEN  PRINT  INK
k;AT c,a(c);w$: LET a(c)=a(c)+1:
 GO SUB 600
430 IF a(c)>d THEN  PRINT  INK
k;AT c,a(c);w$: LET a(c)=a(c)-1:
 GO SUB 600
440 RETURN
490 REM test for a hit
500 IF ATTR (b(d),d)=59 THEN  P
RINT AT b(d),d;"A": GO TO 1000
510 PRINT  INK 2;AT b(d),d;"A"
530 RETURN
590 REM test for a hit
600 IF ATTR (c,a(c))=59 THEN  P
RINT AT c,a(c);"A": GO TO 1000
610 PRINT  INK 1;AT c,a(c);"A"
630 RETURN
690 REM test for a win
700 PRINT AT 21,0;"YOU'VE WON -
Another game ? Y/N"
760 FOR v=24 TO 36
765 BEEP .05,v: BEEP .05,v: BEE
P .05,v:
767 NEXT v
770 INPUT x$
780 IF x$="y" THEN  GO TO 10
790 GO TO 1040
800 RETURN
990 REM HIT
1000 PRINT  INK 3; OVER 1;AT c,d
;"C"
1010 PRINT  FLASH 1;AT 21,0;"YOU
'RE DEAD-Another game Y/N"
1013 FOR v=1 TO 12
1015 BEEP .05,v: BEEP .05,v: BEE
P .05,v:
1017 NEXT v
1020 INPUT x$
1030 IF x$="y" THEN  GO TO 10
1040 STOP
```

DOMEWARS

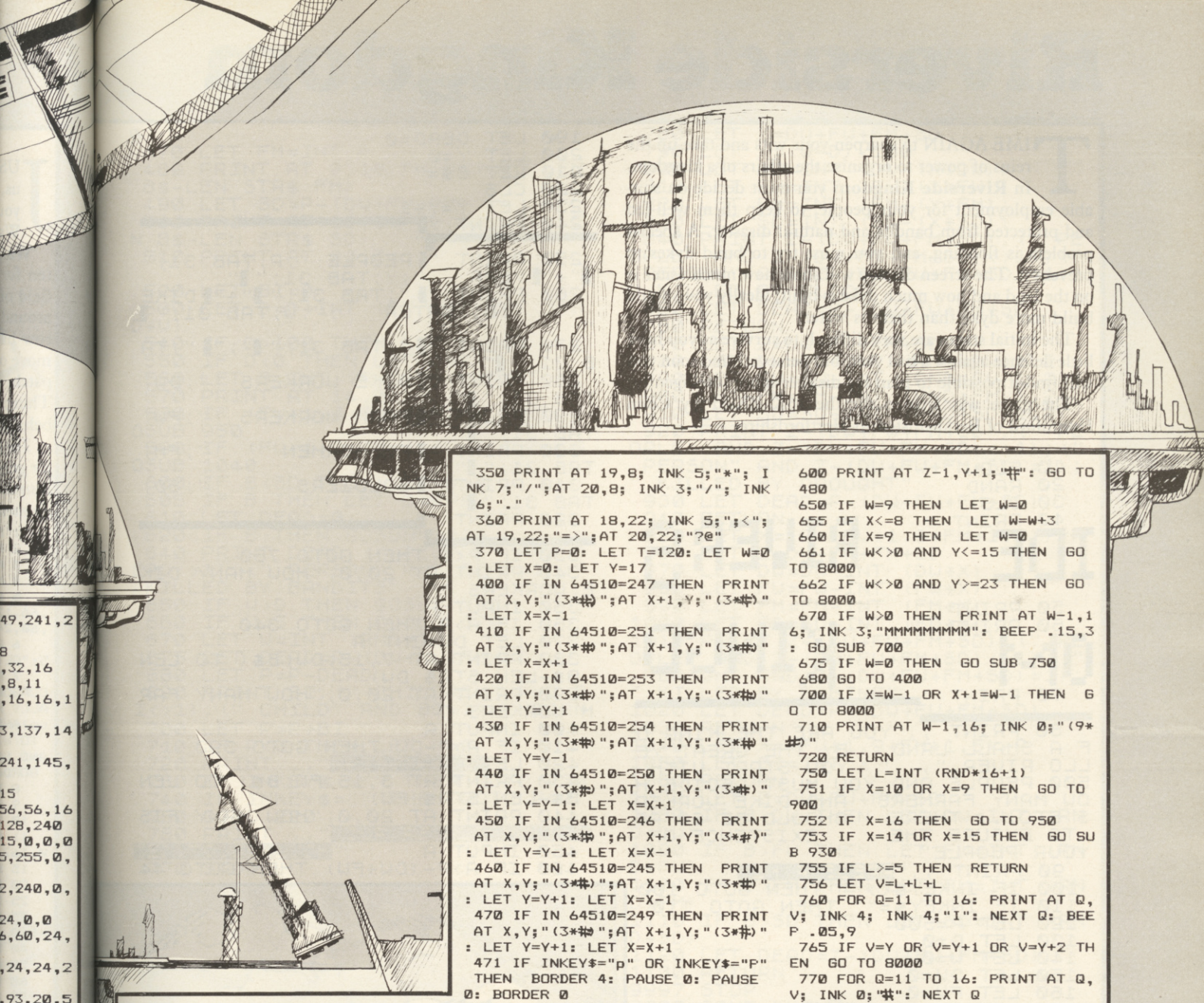


ON AN ALIEN planet a missile is about to be launched at earth. Time is short, and you must run the gauntlet of the alien defences to bomb the domes in which the evil creatures live.

Stuart Box of Thame in Oxfordshire has used an unusual graphics routine to create some spectacular scenery for **Domewars,** which runs on the 48K Spectrum.

The game uses our special abbreviations for graphics instructions, so please refer to the first page of Program Printout for advice on how to enter them before you type in the program.

```
  1 BORDER 0
  2 CLEAR 65023
  3 LET C=43
  4 LET R=C*8
  5 LET N=65367-R
  6 LET F=35-32
  7 LET D=F*8
  8 LET H=N+1-D-256
  9 LET E=H-256*INT (H/256)
 10 PAPER 0: CLS : LET T=251: P
RINT AT 1,12; INK 6; INVERSE 1;"
SAUCER";#0;"(4*sp)WRITTEN BY STU
ART BOX."
 11 INK 6: PRINT AT 3,1;"YOU MO
VE YOUR FLYING SAUCER(5*sp)AROUN
D USING THESE KEYS:-(50*sp)Q=LEF
T(26*sp)W=RIGHT(25*sp)E=DOWN(26*
sp)R=UP(28*sp)T=FIRE"
 12 PRINT AT 11,12;"P=PAUSE";AT
 12,0;"(PRESS ANOTHER KEY TO CON
TINUE)";AT 13,12;"M=QUIT"
 13 PRINT AT 17,1;"YOU CAN PRES
S MORE THAN ONE KEY AT A TIME WH
ICH MEANS YOU CAN(3*sp)MOVE DIAG
ONALLY."
 14 PRINT AT 21,10;"PLEASE WAIT
"
 15 LET T=INT (H/256)
 20 FOR I=N+1 TO N+R: READ A: P
OKE I,A: NEXT I
 35 DATA 0,0,0,0,0,0,0,0
 36 DATA 255,255,255,129,129,25
5,255,255
 37 DATA 0,0,0,0,0,0,0,3
 38 DATA 0,0,0,0,7,56,192,0
 39 DATA 0,0,0,0,224,28,3,0
 40 DATA 0,0,0,0,0,0,0,192
 41 DATA 4,8,16,16,32,32,64,64
 42 DATA 32,33,255,255,153,153,
255,255
 43 DATA 0,0,0,224,228,252,63,6
3
 44 DATA 32,16,8,8,4,4,2,98
 45 DATA 64,79,143,153,153,159,
159,159
 46 DATA 255,255,153,153,255,22
7,227,227
 47 DATA 255,231,231,255,153,15
3,255,255
 48 DATA 0,60,66,66,98,98,98,60
 49 DATA 0,8,8,8,12,12,12,12
 50 DATA 0,124,2,2,60,96,96,62
 51 DATA 0,124,2,2,60,6,6,126
 52 DATA 0,64,96,100,100,126,4,
4
 53 DATA 0,62,64,64,60,6,6,126
 54 DATA 0,62,64,64,124,70,70,1
26
 55 DATA 0,120,8,8,12,12,12,12
 56 DATA 0,60,66,66,60,70,70,60
 57 DATA 0,60,66,66,60,6,6,126
 58 DATA 98,226,225,49,49,241,2
41,241
 59 DATA 0,0,0,0,1,2,4,8
 60 DATA 0,0,0,0,128,64,32,16
 61 DATA 8,11,11,11,8,8,8,11
 62 DATA 16,208,208,208,16,16,1
6,16
 63 DATA 11,24,40,72,143,137,14
5,251
 64 DATA 16,216,212,18,241,145,
137,223
 65 DATA 0,0,0,0,0,1,1,15
 66 DATA 0,0,0,126,129,56,56,16
 67 DATA 0,0,0,0,0,128,128,240
 68 DATA 63,109,118,63,15,0,0,0
 69 DATA 255,182,219,255,255,0,
0,0
 70 DATA 252,222,110,252,240,0,
0,0
 71 DATA 0,36,24,60,60,24,0,0
 72 DATA 255,255,126,126,60,24,
24,0
 73 DATA 24,24,24,24,24,24,24,2
4
 74 DATA 34,62,28,8,127,93,20,5
4
 75 DATA 192,240,248,255,255,24
8,240,192
 76 DATA 3,15,31,255,255,31,15,
3
 77 DATA 15,31,48,96,199,135,0,
0
 210 PRINT #0;"(2*sp)PRESS ANY K
EY TO CONTINUE"
 220 PAUSE 0
 230 CLS
 235 PRINT AT 3,11; INVERSE 1;"T
HE GAME"; INVERSE 0;AT 5,1;"YOU
HAVE TO BOMB THE DOMES(6*sp)BEFO
RE THE TIME RUNS OUT. IF(4*sp)TH
E TIME DOES RUN OUT THE(7*sp)MIS
SILE LAUNCHES AT EARTH !!!!!"
 240 PRINT AT 1,12; INVERSE 1;"S
AUCER"; INVERSE 0;AT 10,1;"TO MA
KE IT EVEN HARDER THERE(4*sp)ARE
 ALSO GUN TURRETS THAT FIRE(2*sp
)AT YOU, SO YOU HAVE TO AVOID(4*
sp)BEING SHOT."
 250 PRINT AT 16,1;"YOUR SCORE G
OES UP TEN WHEN YOU HIT A DOME."
 260 PRINT #0;"(2*sp)PRESS ANY K
EY TO CONTINUE"
 300 PAUSE 0: CLS
 301 PRINT AT 1,12; INVERSE 1;"W
ARNING";AT 3,1; INVERSE 0;"DO NO
T BREAK INTO THIS PROGRAM(2*sp)U
SING THE BREAK KEYS. INSTEAD(3*s
p)PRESS 0."
 302 PRINT #0;"(4*sp)PRESS ANY K
```



```
EY TO PLAY."
 303 PAUSE 0
 304 LET S=0
 305 CLS : POKE 23606,232
 310 POKE 23607,252
 320 BEEP .01,0: FOR Z=0 TO 8: P
RINT AT Z,0;"$$$$$$$$$$$$$$$K";A
T Z,25;"L$$$$$$": NEXT Z: POKE 2
3606,0: POKE 23607,60: PRINT AT
3,2;"SCORE="
 321 PRINT AT 5,2;"TIME=": POKE
23606,232: POKE 23607,252
 325 PRINT AT 21,0;"$$$$$$$$$$$$
$$$$$$$$$$$$$$$$$$$$
```

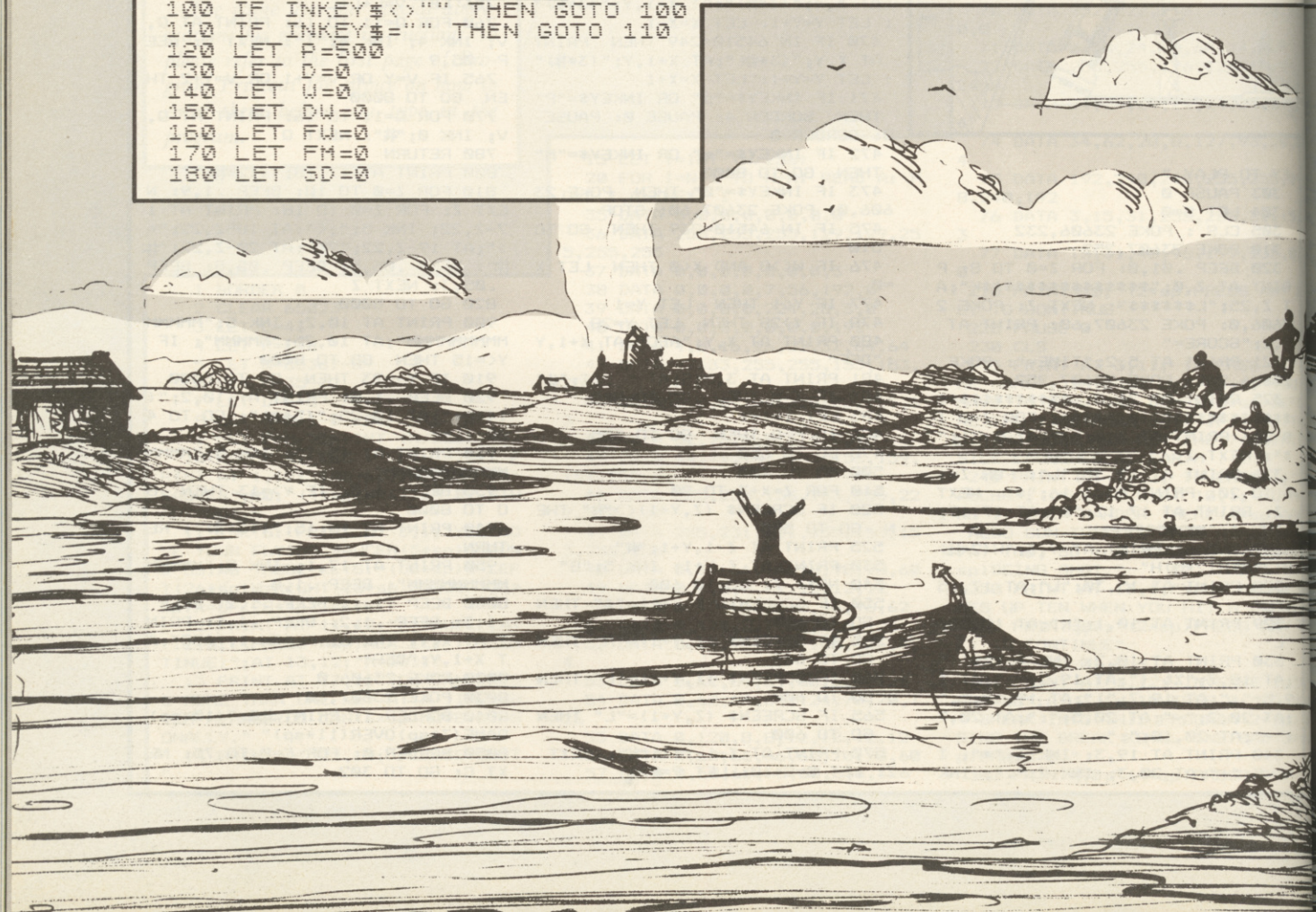
Riverside Kingdom

TIME AGAIN to sharpen your wits and take up the reins of power to organise the affairs of a kingdom. In **Riverside Kingdom** you must decide on suitable employment for your people, to keep them well-fed and protected from bandits and natural disaster. A special problem is flooding, and you must try to build dykes to prevent it. The screen display will show how much water is on the land and how much dyke is built; ideally you should build more dyke than there is water.

The initial stages are very difficult to survive as you have little defence against a bad year, but persevere and soon you will find it possible to plan for disaster more intelligently.

The game was written for the 16K ZX-81 by Colin Hunniford of Berkhamsted in Hertfordshire.

```
 10 SLOW
 20 RAND
 30 CLS
 40 PRINT "
IDE   RIVERS
"
 50 PRINT
 60 PRINT  "
OM    KINGD
 70 PRINT "
"
 80 PRINT ,,"YOU ARE THE KING O
F A SMALL LAND   BY THE GREAT YE
LLO RIVER." ,,,"  YOU START WITH
500 PEOPLE AND YOU MUST DECIDE H
OW MANY FARMERS  AND DIKE WORKER
S ETC... THERE   SHOULD BE SO AS
 TO ENSURE THE     EXISTENCE OF
YOUR PEOPLE"
 90 PRINT ,,"PRESS A KEY"
100 IF INKEY$<>"" THEN GOTO 100
110 IF INKEY$="" THEN GOTO 110
120 LET P=500
130 LET D=0
140 LET W=0
150 LET DW=0
160 LET FW=0
170 LET FM=0
180 LET SD=0
190 LET DEAD=0
200 LET Y=0
210 LET B$="                    "
220 CLS
230 LET Y=Y+1
240 PRINT "
"
250 PRINT "  PEOPLE:";P;TAB 31;"
"+"  YEAR  :";Y;TAB 31;"  "
260 PRINT "  ";TAB 31;"  "+"  DIKE
    :";D,"WATER   :";W;TAB 31;"
"
270 PRINT "  ";TAB 31;"  ";"  ";TA
B 31;"  "
280 PRINT "  DIKE WORKERS :";DW;
TAB 31;"  "
290 PRINT "  FARM WORKERS :";FW;
TAB 31;"  "
300 PRINT "  FISHERMEN    :";FM;
TAB 31;"  "
310 PRINT "  SOLDIERS     :";SD;
TAB 31;"  "
320 PRINT "
"
330 IF P<1 THEN GOTO 760
340 PRINT AT 20,0;"HOW MANY DIK
E WORKERS ?"
350 INPUT A
360 IF A>P THEN GOTO 340
370 LET DW=INT A
380 PRINT AT 7,15;DW;B$( TO LEN
 B$-LEN STR$ DW)
390 PRINT AT 20,0;"HOW MANY FAR
M WORKERS ?"
400 INPUT A
410 IF A>P-DW THEN GOTO 390
420 LET FW=INT A
430 PRINT AT 8,15;FW;B$( TO LEN
 B$-LEN STR$ FW)
440 PRINT AT 20,0;"HOW MANY FIS
HERMEN ?      "
450 INPUT A
460 IF A>P-(DW+FW) THEN GOTO 44
```



```
0
 470 LET FM=INT A
 480 PRINT AT 9,15;FM;B$( TO LEN
 B$-LEN STR$ FM)
 490 LET SD=P-(DW+FW+FM)
 500 PRINT AT 10,15;SD;B$( TO LE
N B$-LEN STR$ SD)
 510 PRINT AT 20,0;"
          "
 520 LET BI=0
 530 LET D=D+INT (DW/10)-INT (RN
D*W)
 540 IF D>100 THEN LET D=100
 550 IF D<0 THEN LET D=0
 560 LET B=INT (RND*(1.9*P))
 570 PRINT AT 14,0;
 580 IF (FW*1.9+FM*1.5)<P THEN G
OSUB 950
 590 IF (FW*1.9+FM*1.5)>P THEN G
OSUB 1040
 600 IF B<SD THEN LET B=0
 605 IF B THEN LET B=B-SD
 610 LET DEAD=0
 620 IF B THEN GOSUB 1070
 640 PRINT DEAD;(" PEOPLE" AND D
EAD<>1);(" PERSON" AND DEAD=1);"
 KILLED BY BANDITS"
 650 IF W>D THEN GOSUB 780
 660 IF W<5 THEN GOSUB 870
 670 LET W=INT (RND*101)
 675 LET DEAD=P-(DW+FW+FM+SD)
 680 LET P=P-DEAD
 690 PRINT BI;(" CHILDREN" AND B
I<>1);(" CHILD" AND BI=1);" BORN"
 700 LET P=P+BI
 710 IF P<0 THEN LET P=0
 720 PRINT ,,"PRESS A KEY"
 730 IF INKEY$<>"" THEN GOTO 730
 740 IF INKEY$="" THEN GOTO 740
 750 GOTO 220
 760 PRINT ,,"YOUR PEOPLE HAVE D
IED,TOUGH LUCK"
 770 STOP
 780 LET Z=DW+FW+FM+SD
 790 LET X=(W-D)/100
 800 LET DW=INT (DW-(X*DW))
 810 LET FW=INT (FW-(X*FW))
 820 LET FM=INT (FM-(X*FM))
 830 LET SD=INT (SD-(X*SD))
 840 PRINT Z-(DW+FW+FM+SD);(" PE
OPLE" AND Z-(DW+FW+FM+SD)<>1);("
 PERSON" AND Z-(DW+FW+FM+SD)=1);
" KILLED BY FLOOD"
 850 LET DEAD=P-(DW+FW+FM+SD)
 860 RETURN
 870 LET Z=DW+FW+FM+SD
 880 LET DW=DW-INT (RND*DW/1.2)
 890 LET FW=FW-INT (RND*FW/1.2)
 900 LET FM=FM-INT (RND*FM/1.2)
 910 LET SD=SD-INT (RND*SD/1.2)
 920 PRINT Z-(DW+FW+FM+SD);(" PE
OPLE" AND Z-(DW+FW+FM+SD)<>1);("
 PERSON" AND Z-(DW+FW+FM+SD)=1);
" KILLED BY DROUGHT"
 930 LET DEAD=P-(DW+FW+FM+SD)
 940 RETURN
 950 LET X=(P-(FW*1.9+FM*1.5))/P
 960 LET Z=DW+FW+FM+SD
 970 LET DW=DW-INT (DW*X)
 980 LET FW=FW-INT (FW*X)
 990 LET FM=FM-INT (FM*X)
1000 LET SD=SD-INT (SD*X)
1010 PRINT Z-(DW+FW+FM+SD);(" PE
OPLE" AND Z-(DW+FW+FM+SD)<>1);("
 PERSON" AND Z-(DW+FW+FM+SD)=1);
" KILLED BY FAMINE"
1020 LET DEAD=P-(DW+FW+FM+SD)
1030 RETURN
1040 LET X=(FW*1.9+FM*1.5)-P
1050 LET BI=INT X
1060 RETURN
1070 LET Z=DW+FW+FM+SD
1080 IF B>DW THEN LET DW=INT (RN
D*DW)
1090 IF B>FW THEN LET FW=INT (RN
D*FW)
1100 IF B>FM THEN LET FM=INT (RN
D*FM)
1110 IF B>SD THEN LET SD=INT (RN
D*SD)
1120 LET DEAD=Z-(DW+FW+FM+SD)
1130 RETURN
9997 STOP
9998 SAVE "KIN"
9999 RUN
```

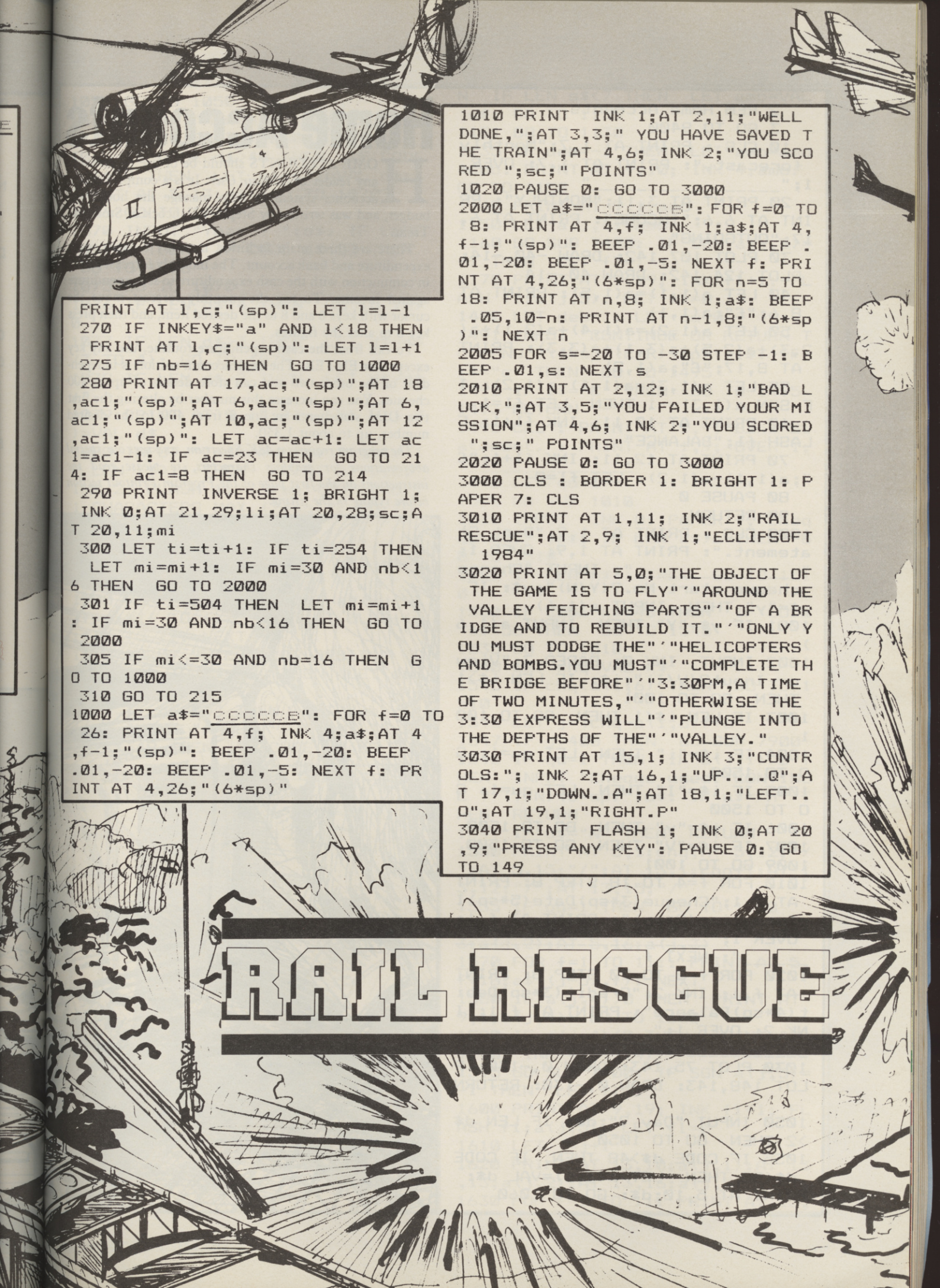
THE 3.30 EXPRESS is hurtling towards disaster. A yawning chasm waits where there used to be a bridge. It is your job, as pilot of a helicopter, to collect the pieces of bridge at the bottom of the chasm and put them back in place before the train thunders across. Unfortunately enemy helicopters and bombs impede your progress, and you must time your efforts carefully to survive. **Rail Rescue** was written for the 16K Spectrum by C Thimbleby and B Knight of Lincoln.

The game uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the game.

```
  10 REM Rail Rescue
  30 FOR x=0 TO 7: READ a: POKE
USR "a"+x,a: NEXT x
  40 DATA 255,56,120,249,255,255
,40,124
  50 FOR x=0 TO 7: READ a: POKE
USR "b"+x,a: NEXT x
  60 DATA 248,144,147,243,255,25
5,102,102
  70 FOR x=0 TO 7: READ a: POKE
USR "c"+x,a: NEXT x
  80 DATA 254,146,146,147,255,25
5,102,102
  90 FOR x=0 TO 7: READ a: POKE
USR "d"+x,a: NEXT x
 100 DATA 0,28,16,56,124,124,124
,56
 110 FOR x=0 TO 7: READ a: POKE
USR "e"+x,a: NEXT x
 120 DATA 255,195,165,153,153,16
5,195,255
 145 GO TO 3000
 150 LET nb=0: LET ti=0: LET mi=
28: LET l=11: LET c=16: LET br=0
: LET li=4: LET sc=0
 162 BORDER 1: INK 7: BRIGHT 0:
CLS
 165 INK 0: PRINT AT 5,0;"EEEEEE
EE";AT 5,24;"EEEEEEEE": FOR f=6
TO 13: PRINT AT f,3;"E";AT f,28;
"E": NEXT f
 170 INK 0: FOR f=0 TO 8: PLOT f
,0: DRAW 0,127: NEXT f: LET b=12
7: FOR a=8 TO 56: PLOT a,0: DRAW
 0,b: LET b=b-INT (RND*5) AND b>
0: NEXT a
 180 INK 0: FOR f=255 TO 247 STE
P -1: PLOT f,0: DRAW 0,127: NEXT
 f: LET b=127: FOR a=247 TO 199
STEP -1: PLOT a,0: DRAW 0,b: LET
 b=b-INT (RND*5) AND b>0: NEXT a
 190 INK 0: BRIGHT 1: INVERSE 1:
 PRINT AT 20,0;"(2*sp)TIME(3*sp)
:328pm(4*sp)SCORE(2*sp):000(2*sp
)";AT 21,0;"(19*sp)LIVES(2*sp):0
04(sp)"
 195 INVERSE 0: BRIGHT 0
 200 PRINT AT 19,8; INK 2;"EEEEE
EEEEEEEEEEEE"
 214 LET ac=8: LET ac1=23
 215 PRINT AT 17,ac; INK 3;"A";A
T 18,ac1;"A";AT 6,ac;"A";AT 6,ac
1;"A";AT 10,ac;"D";AT 12,ac1;"D"
 216 IF ATTR (l,c+1)=59 THEN  LE
T li=li-1: FOR f=0 TO 5: FOR b=0
 TO 7: BEEP .004,b: BORDER b: NE
XT b: NEXT f: BORDER 1
 217 IF ATTR (l,c-1)=59 THEN  LE
T li=li-1: FOR f=0 TO 5: FOR b=0
 TO 7: BEEP .004,b: BORDER b: NE
XT b: NEXT f: BORDER 1
 219 IF li<=0 THEN  GO TO 2000
 220 PRINT  INK 1;AT l,c;"A": IF
 br=1 THEN  PRINT AT l+1,c;"E"
 221 IF br=1 AND l<=17 THEN  PRI
NT AT l+2,c;"(sp)": PRINT AT l+1
,c+1;"(sp)";AT l+1,c-1;"(sp)"
 222 IF l=6 AND br=1 AND ATTR (l
-1,c)<>56 THEN  PRINT AT l+1,c;"
(sp)";AT l-1,c;"E": LET br=0: LE
T nb=nb+1: LET sc=sc+40
 224 IF ATTR (l+1,c)=58 THEN  LE
T br=1: LET sc=sc+20
 240 IF INKEY$="o" AND c>8 THEN
 PRINT AT l,c;"(sp)": LET c=c-1
 250 IF INKEY$="p" AND c<23 THEN
  PRINT AT l,c;"(sp)": LET c=c+1
 260 IF INKEY$="q" AND l>6 THEN
```

```
 PRINT AT 1,c;"(sp)": LET 1=1-1
 270 IF INKEY$="a" AND 1<18 THEN
  PRINT AT 1,c;"(sp)": LET 1=1+1
 275 IF nb=16 THEN  GO TO 1000
 280 PRINT AT 17,ac;"(sp)";AT 18
,ac1;"(sp)";AT 6,ac;"(sp)";AT 6,
ac1;"(sp)";AT 10,ac;"(sp)";AT 12
,ac1;"(sp)": LET ac=ac+1: LET ac
1=ac1-1: IF ac=23 THEN  GO TO 21
4: IF ac1=8 THEN  GO TO 214
 290 PRINT  INVERSE 1; BRIGHT 1;
 INK 0;AT 21,29;li;AT 20,28;sc;A
T 20,11;mi
 300 LET ti=ti+1: IF ti=254 THEN
  LET mi=mi+1: IF mi=30 AND nb<1
6 THEN  GO TO 2000
 301 IF ti=504 THEN  LET mi=mi+1
: IF mi=30 AND nb<16 THEN  GO TO
 2000
 305 IF mi<=30 AND nb=16 THEN  G
O TO 1000
 310 GO TO 215
1000 LET a$="©©©©©©": FOR f=0 TO
 26: PRINT AT 4,f; INK 4;a$;AT 4
,f-1;"(sp)": BEEP .01,-20: BEEP
.01,-20: BEEP .01,-5: NEXT f: PR
INT AT 4,26;"(6*sp)"
```

```
1010 PRINT  INK 1;AT 2,11;"WELL
DONE,";AT 3,3;" YOU HAVE SAVED T
HE TRAIN";AT 4,6; INK 2;"YOU SCO
RED ";sc;" POINTS"
1020 PAUSE 0: GO TO 3000
2000 LET a$="©©©©©©": FOR f=0 TO
 8: PRINT AT 4,f; INK 1;a$;AT 4,
f-1;"(sp)": BEEP .01,-20: BEEP .
01,-20: BEEP .01,-5: NEXT f: PRI
NT AT 4,26;"(6*sp)": FOR n=5 TO
18: PRINT AT n,8; INK 1;a$: BEEP
 .05,10-n: PRINT AT n-1,8;"(6*sp
)": NEXT n
2005 FOR s=-20 TO -30 STEP -1: B
EEP .01,s: NEXT s
2010 PRINT AT 2,12; INK 1;"BAD L
UCK,";AT 3,5;"YOU FAILED YOUR MI
SSION";AT 4,6; INK 2;"YOU SCORED
 ";sc;" POINTS"
2020 PAUSE 0: GO TO 3000
3000 CLS : BORDER 1: BRIGHT 1: P
APER 7: CLS
3010 PRINT AT 1,11; INK 2;"RAIL
RESCUE";AT 2,9; INK 1;"ECLIPSOFT
  1984"
3020 PRINT AT 5,0;"THE OBJECT OF
 THE GAME IS TO FLY"'"AROUND THE
 VALLEY FETCHING PARTS"'"OF A BR
IDGE AND TO REBUILD IT."'"ONLY Y
OU MUST DODGE THE"'"HELICOPTERS
AND BOMBS.YOU MUST"'"COMPLETE TH
E BRIDGE BEFORE"'"3:30PM,A TIME
OF TWO MINUTES,"'"OTHERWISE THE
3:30 EXPRESS WILL"'"PLUNGE INTO
THE DEPTHS OF THE"'"VALLEY."
3030 PRINT AT 15,1; INK 3;"CONTR
OLS:"; INK 2;AT 16,1;"UP....Q";A
T 17,1;"DOWN..A";AT 18,1;"LEFT..
O";AT 19,1;"RIGHT.P"
3040 PRINT  FLASH 1; INK 0;AT 20
,9;"PRESS ANY KEY": PAUSE 0: GO
TO 149
```



Home Accounts

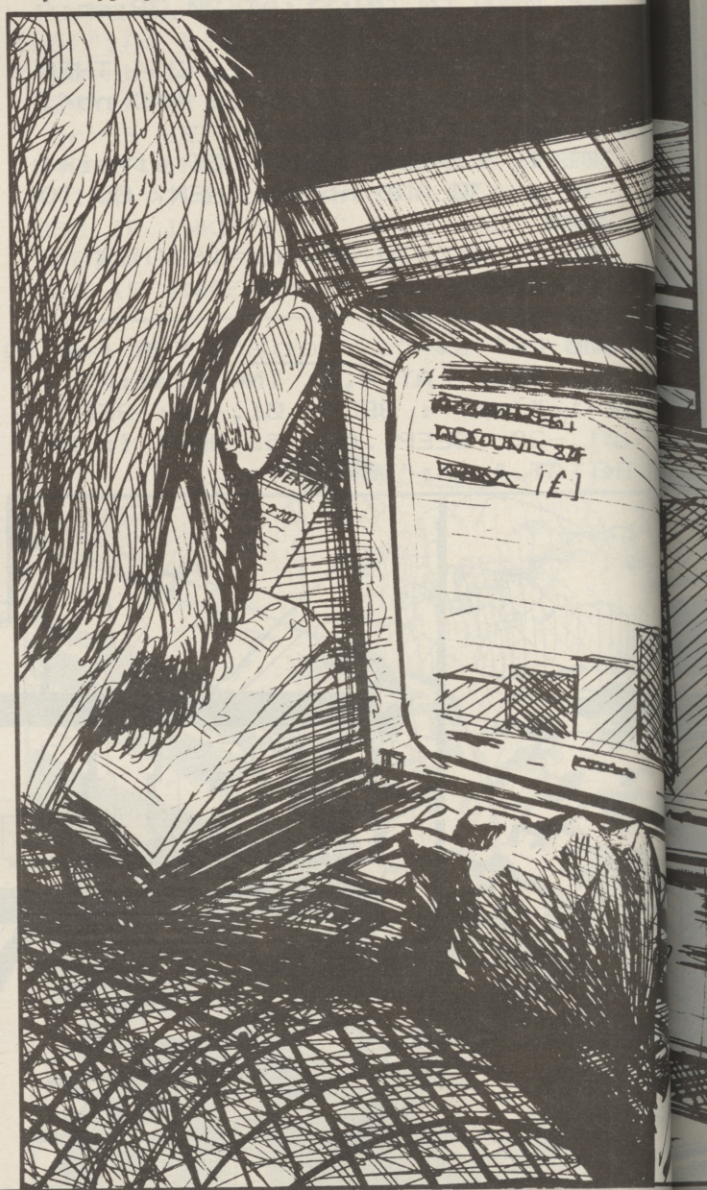
HOME ACCOUNTS should be of use to virtually any reader of *Sinclair User*. It is a comprehensive accounts system to help manage the household budget, and was written by Stephen Hancock of Stoke-on-Trent.

There are three main facilities, monthly forecast, cash expenditure and bank account. The monthly forecast works in conjunction with the cash expenditure to set expenditure against income. To use the monthly forecast move the cursor with keys 6 and 8 to the desired item, and then press key 8 to alter the figures.

To exit from the cash expenditure routine, use any key except 0 or ENTER. The bank account section is independent of the other two and can store details of up to 400 cheques. You can increase this number by altering the first two DIM statements in line 8 from 400 to the desired number, up to about 1,350.

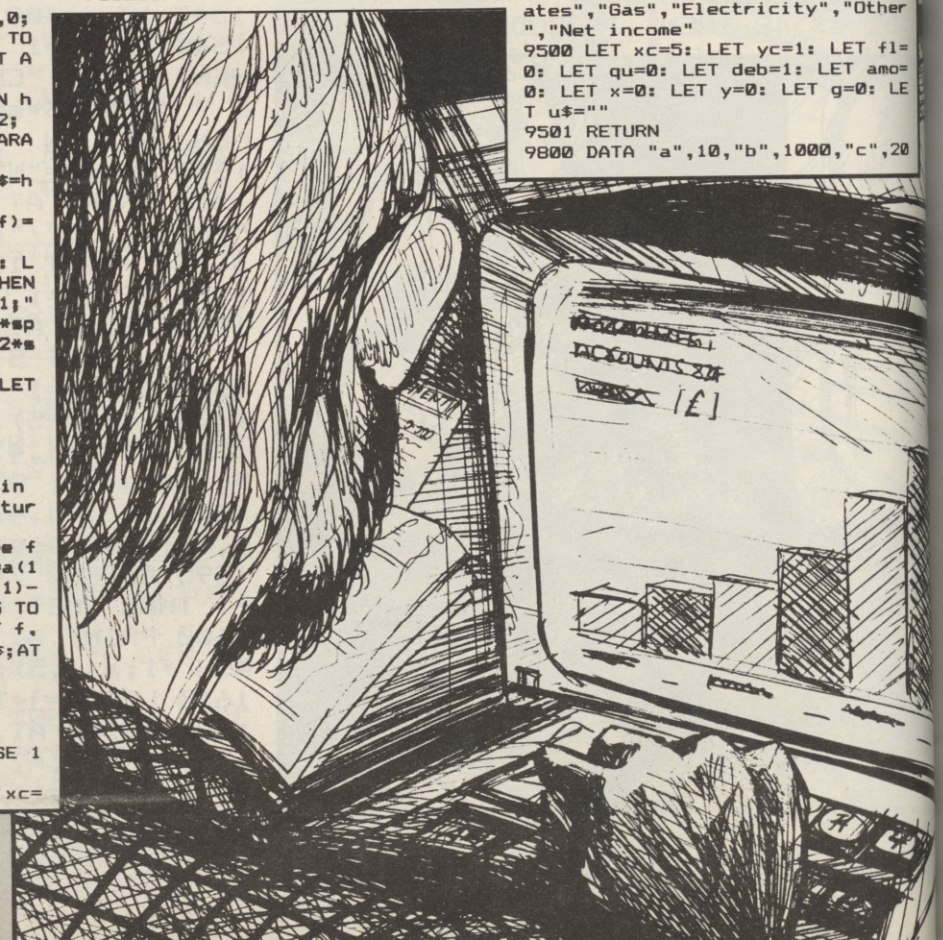
The program requires a 48K Spectrum, and uses our special abbreviations for graphics characters, so please read the instructions on the first page of the Program Printout section before typing in the listing.

```
   2 REM Home Accounts
   3 GO TO 8400
  10 CLS : PRINT AT 1,7;"Monthly
 forecast.": PRINT AT 1,7; OVER
1;"__________________"
  20 PRINT AT 3,11;"MONTHLY": PR
INT AT 6,6;"INCOME": PRINT AT 6,
17;"OUTGOING"
  30 PLOT 107,142: DRAW -40,-14:
 PLOT 124,142: DRAW 40,-14
  40 LET a(1,1)=a(1,5): PRINT AT
 8,6;"£";a(1,1)
  50 LET a(1,2)=a(1,4)+a(2,1)+a(
2,3)+a(2,5)+a(3,1)+a(3,3): PRINT
 AT 8,17;"£";a(1,2)
  55 LET a(1,3)=a(1,1)-a(1,2): I
F SGN a(1,3)=-1 THEN  LET f1=1
  60 PRINT AT 10,11; INK f1+1; F
LASH f1;"BALANCE"
  70 PRINT AT 12,11; INK f1+1;"£
";a(1,1)-a(1,2): LET f1=0
  80 PAUSE 0
  90 RETURN
1000 CLS : PRINT AT 1,9;"Bank St
atement.": PRINT AT 1,9; OVER 1;
"_____________": INPUT "Change
 cheque start No.?(Y/N)";y$: IF
y$="y" THEN  INPUT a(1,6)
1001 IF y$="Y" THEN  INPUT a(1,6
)
1002 INPUT  INK 0; PAPER 7;"View
 or Input?(V/I)";i$: IF LEN i$>1
 THEN  GO TO 1001
1003 IF LEN i$<1 THEN  GO TO 100
1
1004 IF i$="i" THEN  LET qu=1: G
O TO 1500
1005 IF i$="I" THEN  LET qu=1: G
O TO 1500
1006 IF i$="v" THEN  GO TO 1500
1007 IF i$="V" THEN  GO TO 1500
1009 GO TO 1001
1010 FOR f=4 TO 18 STEP 8: PRINT
 AT f,1;"Cheque(3*sp)Date(5*sp)I
nformation(2*sp)": PRINT AT f,1;
 OVER 1;"_____________________
______": NEXT f
1020 FOR f=8 TO 20 STEP 8: PRINT
 AT f,1; INK 2;"Credit(3*sp)Debi
t(4*sp)Balance": PRINT AT f,1; I
NK 2; OVER 1;"_________________
___________": NEXT f
1030 PLOT 75,143: DRAW 0,-130: P
LOT 148,143: DRAW 0,-130: RETURN

1050 INPUT "Day ?";d$: IF LEN d$
>2 THEN  GO TO 1050
1055 IF CODE d$>48 THEN  IF CODE
 d$<58 THEN  LET a(j,1)=VAL d$:
PRINT AT 5,10;d$: GO TO 1060
```



```
1056 GO TO 1050
1060 INPUT "Month ?";d$: IF LEN
d$>2 THEN  GO TO 1060
1065 IF CODE d$>48 THEN  IF CODE
 d$<58 THEN  LET a(j,2)=VAL d$:
PRINT AT 5,13;d$: GO TO 1070
1066 GO TO 1060
1070 INPUT "Year ? ";d$: IF CODE
 d$>48 THEN  IF CODE d$<58 THEN
 GO TO 1076
1075 GO TO 1070
1076 IF LEN d$>4 THEN  GO TO 107
0
1077 IF LEN d$>3 THEN  LET d$=d$
(3 TO 4): GO TO 1079
1078 IF LEN d$>2 THEN  LET d$=d$
+" "
1079 PRINT AT 5,16;d$: LET a(j,3
)=VAL d$
1080 INPUT "Information ?";i$: I
F LEN i$>11 THEN  PRINT AT 3,0;
INK 2; FLASH 1;"(3*sp)TOO LONG 1
1 CHARACTERS MAX.(2*sp)": GO TO
1080
1090 PRINT AT 3,0;"(32*sp)"
1095 IF LEN i$<11 THEN  LET i$=i
$+"(sp)": GO TO 1095
1100 FOR f=1 TO 11: LET a$((j-5)
,f)=i$(f TO f): PRINT AT 5,18+f;
i$(f TO f): NEXT f
1110 INPUT "CREDIT OR DEBIT ? (C
/D)";g$: IF g$="d" THEN  LET deb
=-1
1120 IF g$="D" THEN  LET deb=-1
1130 INPUT "AMOUNT ? ";s$: IF CO
DE s$>48 THEN  IF CODE s$<58 THE
N  IF LEN s$<7 THEN  LET amo=VAL
 s$: GO TO 1135
1131 GO TO 1130
1135 IF deb=-1 THEN  LET amo=amo
*deb: PRINT AT 9,10; INK 4;amo:
GO TO 1150
1140 PRINT AT 9,1;amo
1150 LET a(j,4)=amo
1160 GO SUB 7400: IF SGN a(j,5)=
-1 THEN  LET f1=1
1170 PRINT AT 9,19; INK f1+1; FL
ASH f1;a(j,5): LET f1=0
1490 LET deb=1: LET qu=0
1491 INPUT "CONTINUE OR RETURN T
O MENU ?(4*sp)(C/R)(sp)";l$: IF
l$="c" THEN  GO TO 1495
1492 IF l$="C" THEN  GO TO 1495
1493 RETURN
1495 CLS : PRINT AT 1,9;"Bank St
atement.": PRINT AT 1,9; OVER 1;
"----------------"
1496 LET qu=1
1500 GO SUB 1010
1510 INPUT  INK 0; PAPER 7;"Cheq
ue No.?";k$: IF LEN k$>6 THEN  G
O TO 1510
1520 IF LEN k$<1 THEN  GO TO 151
0
1530 IF CODE k$>48 THEN  IF CODE
 k$<58 THEN  GO TO 1540
1535 GO TO 1510
1540 LET chq=VAL k$
1545 IF chq<a(1,6) THEN  GO TO 1
510
1546 LET j=(chq-a(1,6))+6
1547 IF j>400 THEN  GO SUB 7900
1548 IF qu=1 THEN  IF a(j,1)>0 T
HEN  INPUT "Cheque used. CONTINU
E ? (Y/N)(3*sp)";u$: IF u$="n" T
HEN  RETURN
1549 IF u$="N" THEN  RETURN
1550 PRINT AT 5,1;chq;AT 5,12;"/
";AT 5,15;"/";AT 13,1;chq+1;AT 1
3,12;"/";AT 13,15;"/"
1555 IF qu=1 THEN  GO TO 1050
1560 PRINT AT 5,10;a(j,1);AT 5,1
3;a(j,2);AT 5,16;a(j,3)
1570 FOR f=1 TO 11:: PRINT AT 5,
f+18;a$((j-5),f): NEXT f
1580 IF a(j,4)>0 THEN  PRINT AT
9,1;a(j,4): GO TO 1600
1590 IF a(j,4)<0 THEN  PRINT AT
9,10; INK 4;a(j,4)
1595 GO SUB 7400: IF SGN a(j,5)=
-1 THEN  LET f1=1
1600 PRINT AT 9,19; INK f1+1; FL
ASH f1;a(j,5): LET f1=0
1610 LET j=j+1
1620 PRINT AT 13,10;a(j,1);AT 13
,13;a(j,2);AT 13,16;a(j,3)
1630 FOR f=1 TO 11: PRINT AT 13,
```

```
f+18;a$((j-5),f): NEXT f
1640 IF a(j,4)>0 THEN  PRINT AT
17,1;a(j,4): GO TO 1660
1650 IF a(j,4)<0 THEN  PRINT AT
17,10; INK 4;a(j,4)
1655 GO SUB 7400: IF SGN a(j,5)=
-1 THEN  LET f1=1
1660 PRINT AT 17,19; INK f1+1; F
LASH f1;a(j,5): LET f1=0
1670 INPUT "CONTINUE OR RETURN T
O MENU ?(4*sp)(C/R)(sp)";l$: IF
l$="c" THEN  GO TO 1690
1680 IF l$="C" THEN  GO TO 1690
1685 RETURN
1690 CLS : PRINT AT 1,9;"Bank St
atement.": PRINT AT 1,9; OVER 1;
"  _____"
1700 GO TO 1500
2000 CLS : PRINT AT 1,3;"Probabl
e cash expenditure.": PRINT AT 1
,3; OVER 1;"_____
_____"
2010 PRINT AT 5,3;"ITEM";TAB 20;
"Expenditure";AT 5,3; OVER 1;"__
_____"
2015 LET a(1,4)=a(4,3)+a(4,4)+a(
4,5)+a(4,6)+a(5,1)+a(5,2)+a(5,3)
+a(5,4)+a(5,5)+a(5,6)
2020 FOR f=1 TO 9: PRINT AT f+5,
2;f;")";TAB 20;"£": NEXT f: PRIN
T AT 15,1;"10)";TAB 20;"£": PRIN
T AT 18,1;"TOTAL EXPENDITURE= £"
;a(1,4)
2021 FOR f=1 TO 10: FOR d=1 TO 1
5: PRINT AT f+5,d+4;b$(f,d): NEX
T d
2022 LET f=f+20: GO SUB 7700: PR
INT AT f-15,21;a(x,y): LET f=f-2
0: NEXT f
2025 PLOT 158,138: DRAW 0,-90
2030 PRINT AT 3,3;"Key 0 to alte
r items"
2040 PAUSE 0: IF INKEY$>"0" THEN
  RETURN
2050 INPUT "ITEM No.?";v$: IF CO
DE v$>48 THEN  IF CODE v$<58 THE
N  LET b=VAL v$: GO TO 2052
2051 GO TO 2050
2052 IF b<1 THEN  PRINT AT 4,0;
INK 2; FLASH 1;"(9*sp)NUMBER TOO
 SMALL(7*sp)": PAUSE 0: PRINT AT
 4,0;"(32*sp)": GO TO 2050
2055 IF b>10 THEN  PRINT AT 4,0;
 INK 2; FLASH 1;"(9*sp)NUMBER TO
O LARGE(7*sp)": PAUSE 0: PRINT A
T 4,0;"(32*sp)": GO TO 2050
2060 INPUT "ITEM ?";h$: IF LEN h
$>15 THEN  PRINT AT 4,0; INK 2;
FLASH 1;"(3*sp)TOO LONG 15 CHARA
CTERS MAX.(2*sp)": GO TO 2060
2070 IF LEN h$<16 THEN  LET h$=h
$+"(sp)": GO TO 2070
2080 FOR f=1 TO 16: LET b$(b,f)=
h$(f TO f): NEXT f
2090 INPUT "EXPENDITURE?";exp: L
ET e$=STR$ exp: IF LEN e$>6 THEN
  PRINT AT 4,0; INK 2; FLASH 1;"
(6*sp)TOO LONG MAX. 10 CHRS(5*sp
)": PAUSE 0: PRINT AT 0,4;"(32*s
p)": GO TO 2090
2100 LET b=b+2: IF b>6 THEN  LET
 b=b-6: LET g=1
2110 LET a(4+g,b)=exp
2997 LET g=0
2998 GO TO 2000
3000 CLS : PRINT AT 1,3;"Key in
average monthly(10*sp)expenditur
e on the following"
3010 PRINT #0;"To exit and see f
orecast press 5": LET a(3,5)=a(1
,5)-a(2,1)-a(2,3)-a(2,5)-a(3,1)-
a(3,3): RESTORE 9000: FOR f=5 TO
 17 STEP 2: READ c$: PRINT AT f,
19;"(11*sp)": PRINT AT f,3;c$;AT
 f,14;":- £"
3011 GO SUB 7700
3019 PRINT AT f,19;a(x,y)
3020 NEXT f
3030 PRINT AT xc,yc;">": PAUSE 1
0
3040 IF INKEY$="7" THEN  LET xc=
xc-2: PRINT AT xc+2,yc;"(sp)": I
F xc<5 THEN  LET xc=xc+2
3050 IF INKEY$="6" THEN  LET xc=
xc+2: PRINT AT xc-2,yc;"(sp)": I
F xc>15 THEN  LET xc=xc-2
3060 IF INKEY$="8" THEN  INPUT a
q: GO SUB 7800: GO TO 3010
3070 IF INKEY$="5" THEN  GO TO y
3080 GO TO 3030
7400 FOR f=1 TO (j-6): IF a(j-f,
1)>0 THEN  LET a(j,5)=a(j-f,5)+a
(j,4): RETURN
7410 NEXT f: LET a(j,5)=a(j,4):
RETURN
7700 IF f=24 THEN  LET x=4: LET
y=6: RETURN
7705 IF f=30 THEN  LET x=5: LET
y=6: RETURN
7710 LET x=INT (f/6)+1
7720 LET y=(f/6-INT (f/6))*6
7730 RETURN
7800 LET x=INT (xc/6)+1: LET y=(
xc/6-INT (xc/6))*6: LET a(x,y)=a
q: RETURN
7900 CLS : PRINT : PRINT "Sorry
this filing system cannot cope w
ith this amount of data.(2*sp)In
creasing capacity will clear(2*s
p)files and lengthen data storag
e and retrieval times."
7901 PRINT " To increase: break
into the(4*sp)program and EDIT l
ine 8400.Then extend the first a
nd second(5*sp)arrays by up to 9
50(extra).Also line 1547 will ne
ed to be(7*sp)altered accordingl
y by adding(3*sp)the same amount
 on to the 400."
7902 INPUT  INK 2; PAPER 7; FLAS
H 1;"BREAK ? (Y/N) ";n$: IF n$="
y" THEN  STOP
7903 IF n$="Y" THEN  STOP
7904 CLS : LET qu=0: GO TO 8401
8400 GO SUB 9500: DIM a(400,6):
DIM a$(400,11): DIM b$(10,16)
8401 PAPER 7: INK 0: BRIGHT 0: F
LASH 0: CLS : BORDER 1
8500 PRINT AT 1,5;"Home accounts
 controler": PRINT AT 1,5; OVER
1;"_____"
8510 PRINT AT 4,3;"a) Monthly fo
recast."
8520 PRINT AT 6,3;"b) Bank state
ment."
8530 PRINT AT 8,3;"c) Probable c
ash expenditure."
8540 PRINT AT 10,3;"d) Alter for
ecast."
8550 PRINT AT 12,3;"e) Save data
 to tape.": PRINT AT 14,3;"f) Lo
ad data from tape."
8555 PRINT AT 16,3;"g) Reset pro
gram."
8556 PRINT AT 18,3;"h) Quit prog
ram."
8560 INPUT "Select option:-";o$
8570 RESTORE 9800: FOR f=0 TO 15
: READ q$,q: IF q$=o$ THEN  GO S
UB q: GO TO 8401
8580 NEXT f: GO TO 8560
8900 SAVE "Banc Data" DATA a():
POKE 23736,181: PAUSE 60: SAVE "
Data (2)" DATA a$(): POKE 23736,
181: PAUSE 60: SAVE "Data (3)" D
ATA b$(): PRINT  0; FLASH 1;"Sto
p tape.Press any key.": PAUSE 0:
 INPUT "VERIFY DATA ? (Y/N) ";s$
: IF s$="y" THEN  GO TO 8930
8910 IF s$="Y" THEN  GO TO 8930
8920 RETURN
8930 VERIFY "Banc Data" DATA a()
: VERIFY "Data (2)" DATA a$(): V
ERIFY "Data (3)" DATA b$(): RETU
RN
8950 CLS : PRINT  0;"Start tape.
": LOAD "Banc Data" DATA a(): LO
AD "Data (2)" DATA a$(): LOAD "D
ata (3)" DATA b$(): PAUSE 5: CLS
 : PRINT #0; FLASH 1;"Stop tape.
 Press any key.": PAUSE 0: RETUR
N
8980 CLS : INPUT  INK 2; PAPER 7
; FLASH 1;"Are you sure?(Y/N)";t
$: IF t$="y" THEN  RUN
8981 IF t$="Y" THEN  RUN
8982 RETURN
8990 CLS : INPUT  INK 2; PAPER 7
; FLASH 1;"Are you sure?(Y/N)";t
$: IF t$="y" THEN  RANDOMIZE USR
 0
8991 IF t$="Y" THEN  RANDOMIZE U
SR 0
8995 RETURN
9000 DATA "Income","Mortgage","R
ates","Gas","Electricity","Other
","Net income"
9500 LET xc=5: LET yc=1: LET f1=
0: LET qu=0: LET deb=1: LET amo=
0: LET x=0: LET y=0: LET g=0: LE
T u$=""
9501 RETURN
9800 DATA "a",10,"b",1000,"c",20
```



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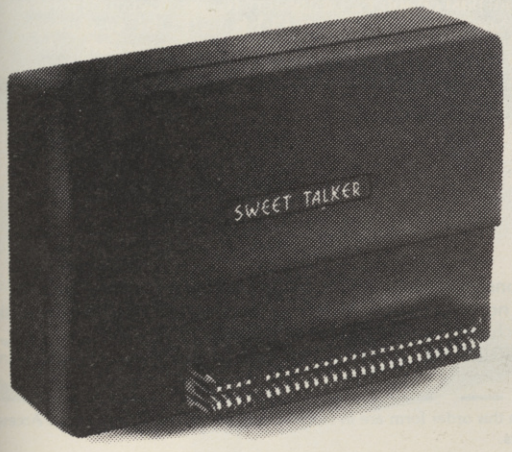

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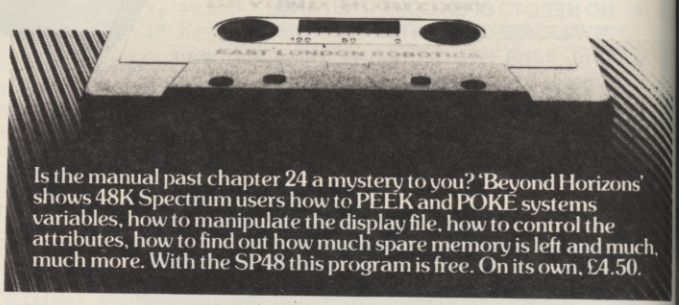

Is the manual past chapter 24 a mystery to you? 'Beyond Horizons' shows 48K Spectrum users how to PEEK and POKE systems variables, how to manipulate the display file, how to control the attributes, how to find out how much spare memory is left and much, much more. With the SP48 this program is free. On its own, £4.50.

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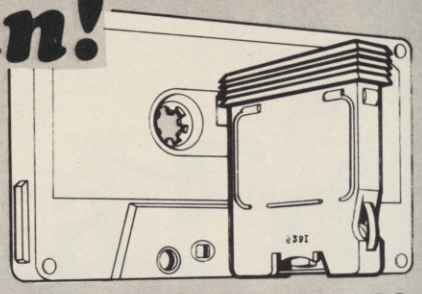

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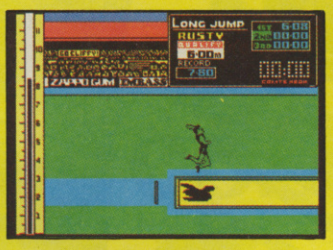

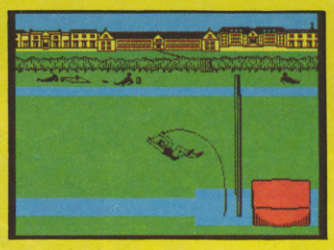

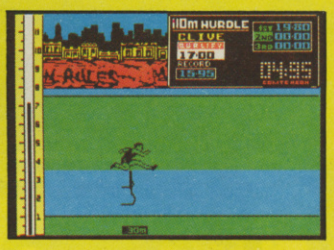

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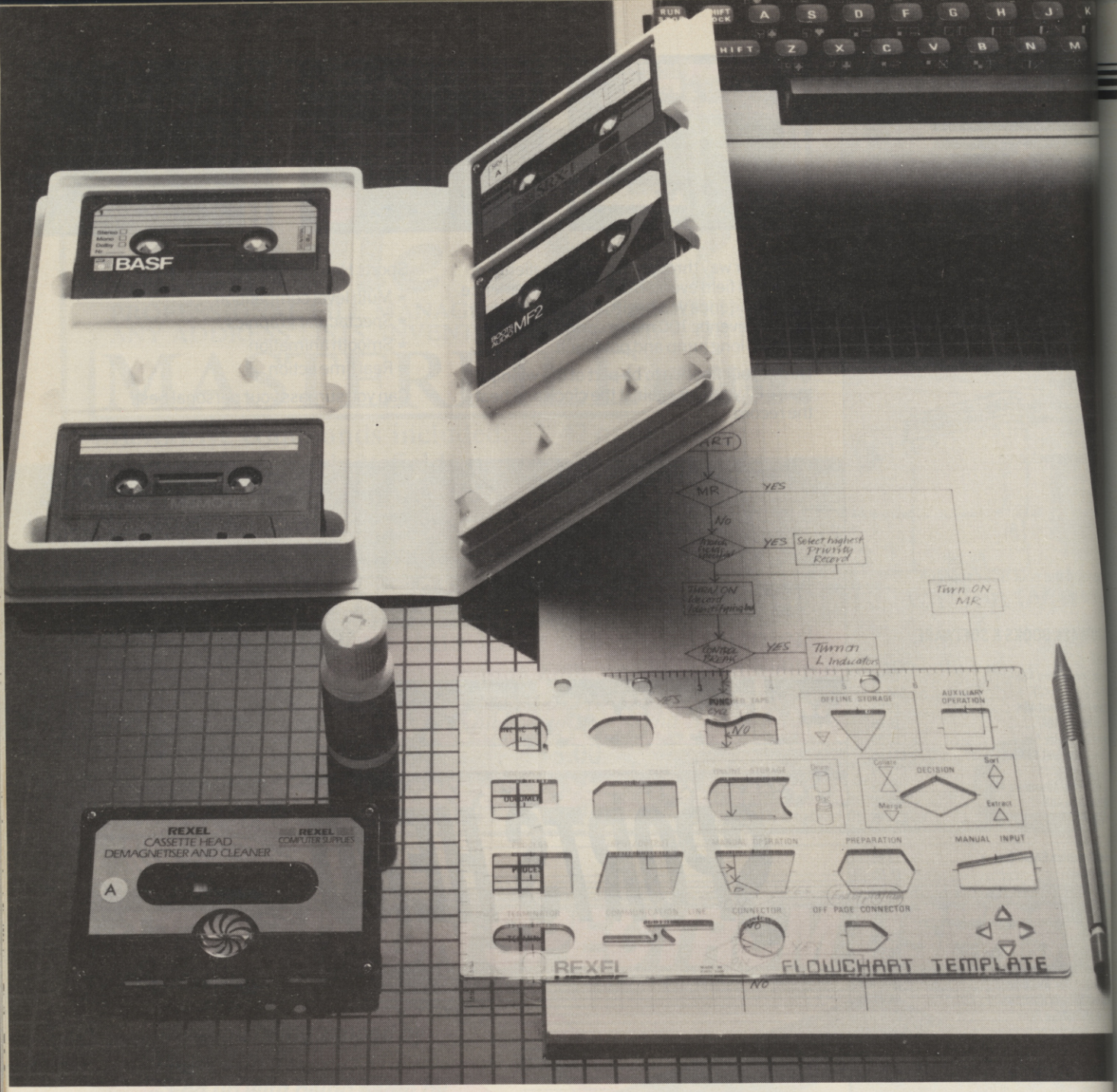

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Adding commands to Spectrum Basic

Keith Williams presents a detailed explanation on how to use interrupts on the Spectrum and provides a useful trace function for printing program line numbers

ONE OF THE problems of adding new commands and routines to the Spectrum Basic is that it is held in ROM. That means that all the computer operations are under the control of an immutable program which cannot be stopped.

Although it is easy to write new routines they can only be called by means of a very user unfriendly RAND USR call. Passing of information into and out of those routines is also difficult without a whole chain of pokes. Even then it may be impossible to get the routine to work as it may be needed at the execution of every line.

There is, however, one very simple way of beating the ROM and that is to use interrupts. While exploring this idea we can also develop a new command for the the Spectrum. If you are not interested in the detailed explanation you can still follow the instructions and load up the final program which gives a very useful trace function, an essential tool when debugging along Basic programs.

A trace function is a machine code routine which prints on screen, while a program is running, the number of the line which is currently being executed.

The Spectrum is based on the popular Z-80A microprocessor. On that microprocessor are two electrical connections which are involved with interrupts. The first is the NMI which is of little use to our present purposes and so we will ignore it. When the voltage applied to the other pin changes we say that an interrupt occurs. That causes the processor to stop what it is doing, make a note of where it has reached and then jump to follow another program called the interrupt service routine. When that is finished it returns to its place in the original program.

There are three interrupt modes available on the microprocessor. IM0 is designed for use with peripherals such as printers and the like. When the peripheral needs servicing, such as requiring more information, then it sends the interrupt message and then an address. The computer, in IM0, will run the routine starting at that address before returning from the interrupt.

IM1 is the mode normally used by the Spectrum. When an interrupt occurs it will carry out the routine at address 56. That routine in the ROM does various housekeeping tasks such as reading the keyboard. The Spectrum is wired in such a way that an interrupt comes with every fluctuation in the mains voltage, in Britain that occurs 50 times a second.

IM2 is much more useful. In that mode the processor jumps to a service routine the address of which must calculate from two numbers. The first of those numbers comes from the thing causing the interrupt. In a Spectrum this number 255 — or FF in Hex — is supplied by the hardware. The other number is programmed in. It is kept in a special store known as the I register. The processor jumps to the address 256*I+255. Just to make things more complicated this computed address is not the start address but is the address of a store holding the start address.

To get our program on the way we must first poke its start address into another address — whose Hex value is xxFF. Then we must put its vector address — the xx from before — into I. That sounds complicated but really it is simple. There is, however, one problem. The screen chip in the Spectrum works in such a way that putting the vector in the first 16K of RAM causes difficulties for the machine. If you want to use interrupt routines on a 16K machine you must be very devious. If you put 40 into the I register then the processor will look at 40*256+255=10495 for a start address. That is in ROM and it contains the start address 32348 or 7E5C in Hex. On the 48K Spectrum you have more leeway and can either use the 16K trick or use the number 128 (80 Hex) in I.

And so to the routines. A word first about getting them into memory. If you have an assembler then it is easy. If you do not then you will need a **Hexloader** program. One is provided in listing 1. You must first type it in and then save it. It enables you to type in the machine code and then save that.

When entering the machine code routines in listing 2 type in only the digits

continued on page 122

Listing 1: Hexloader

```
    5 DEF FN z$(n)=z$(n+1)
   10 DEF FN a(x$)=CODE x$-48-7*(
x$>="A")
   15 DEF FN b()=16*FN a(a$(1))+F
N a(a$(2))
   20 POKE 23658,8
   30 INPUT "Start address "; LIN
E b$
   40 LET a$=b$(1 TO 2): LET h=FN
 b(): LET a$=b$(3 TO 4): LET l=F
N b()
   50 POKE 23728,h: POKE 23729,l:
 LET s=256*h+l: CLEAR s-1
   55 LET z$="0123456789ABCDEF"
   60 LET start=256*PEEK 23728+PE
EK 23729: LET add=start
   70 GO SUB 2000
   75 PRINT 'f$;"    ";
   80 INPUT "Enter code "; LINE b
$
   90 IF b$="" THEN  GO TO 80
  100 IF b$(1)="R" THEN  LET add=
add-1: GO TO 70
  105 IF b$(1)="S" THEN  GO TO 50
0
  110 IF LEN b$<2 THEN  GO TO 80
  120 LET a$=b$( TO 2): LET byte=
FN b()
  130 POKE add,byte: LET add=add+
1
  135 PRINT a$;"  ";
  140 IF LEN b$>2 THEN  LET b$=b$
(3 TO ): GO TO 100
  150 GO TO 70
  500 INPUT "Do you want to save
"; LINE b$
  510 IF b$="N" THEN  STOP
  520 INPUT "Name "; LINE b$
  530 CLS : SAVE b$CODE start,add
-start
  540 STOP
2000 REM change to hex
2010 LET h=INT (add/256): LET hh
=INT (h/16): LET f$=FN z$(hh)+FN
 z$(h-hh*16)
2020 LET h=add-h*256: LET hh=INT
 (h/16): LET f$=f$+FN z$(hh)+FN
z$(h-hh*16)
2030 RETURN
```

continued from page 121

and letters in the column 'hexcode'. Type in a whole line at a time and the address and code will appear on the screen. If you make a mistake then typing in 'r' will enable you to retype the previous line. When you have typed the last line of hex then an 'S' will lead to a save routine to keep the hex on tape.

To minimise errors and make it easier to explain the program as a whole, it has been divided into its various subroutines. Type those in one at a time; later they can be put together, using the **Collator** program in listing 3.

The first pair of routines, **TRON** and **TROFF,** are the ones which switch the interrupt vectors around. TRON loads the register I with 0FEH, that is, 254. That means that the vector holding the start address of our routine must be placed at address 0FEFFH, that is, 65279. The register I cannot be loaded directly and so we must first load the value into the A register. IM2 is selected for the reasons already stated and the remaining instructions DI and EI switch interrupts off and on. Strictly speaking they are not essential here but it might cause confusion for the machine if it was interrupted during this short routine at the wrong place.

TRON is really quite separate from the rest of the program. Its job is to set the machine up so that we can switch the trace function on or off at will. It must therefore be called early on by a USR call. More about that later when the whole program is in.

TROFF performs the opposite function in that it resets the machine to normal interrupts. You will notice that I is loaded with 3FH or 63. That is the address (3FFF) that the ROM sets up as an interrupt vector on power up. In interrupt mode 2 that would cause a jump to address 60 which is part way through the normal interrupt routine. It is important, therefore, when resetting to put the machine into IM1. The only USR call that is necessary anywhere in this program is the initial one to TRON. TROFF is called by means of a normal Basic variable.

Type in the machine code and save it. The start address is FE7E. The pair of routines can be saved together under the name 'tron'.

Once the whole program is in and enabled it is necessary to be able to switch the trace on and off. That can be done from Basic by inserting the line LET trace = x, where x can be one of three values: '1' will cause a call to TROFF thereby disabling trace; '0' will

Listing 2. TRON & TROFF

Add	hexcode	label	Assembler		Comments
FE7E	F3	TRON	DI		switch off interrupts
FE7F	3EFE		LD	A,0FEH	set up vector address
FE81	ED47		LD	I,A	to FEFF
FE83	ED5E		IM	2	select mode 2
FE85	FB		EI		switch interrupts on
FE86	C9		RET		return to BASIC
FE87	FE	TROFF	DI		interrupts off
FE88	3E3F		LD	A,3FH	restore the interrupt
FE8A	ED47		LD	I,A	vector address to 3EFF
FE8C	ED56		IM	1	restore mode 1
FE8E	FB		EI		interrupts on
FE8F	C9		RET		return
		TRQ			
		ELINE	EQU	5C59H	
		VARS	EQU	5C4BH	
		ORG	0FE90H		
FE90	2A595C	TRQ	LD	HL,(ELINE)	calculate the length
FE93	ED5B4B5C		LD	DE,(VARS)	of variables area
FE97	A7		AND	A	
FE98	ED52		SBC	HL,DE	
FE9A	E5		PUSH	HL	put length into BC
FE9B	C1		POP	BC	
FE9C	EB		EX	DE,HL	put variables start in to HL
FE9D	3EB4	SEARCH	LD	A,0B4H	put code for "t" as first letter into A
FE9F	EDB1		CPIR		carry out search
FEA1	2806		JR	Z,FOUND	
FEA3	78		LD	A,B	end of variables?
FEA4	B1		OR	C	
FEA5	2824		JR	Z,ZERO	if so then there is no trace
FEA7	18F4		JR	SEARCH	search on
FEA9	3E72	FOUND	LD	A,72H	is next letter "r"?
FEAB	BE		CP	(HL)	
FEAC	20EF		JR	NZ,SEARCH	search on if not
FEAE	23		INC	HL	is next byte "a"?
FEAF	3E61		LD	A,61H	
FEB1	BE		CP	(HL)	
FEB2	20E9		JR	NZ,SEARCH	
FEB4	23		INC	HL	is next byte "c"?
FEB5	3E63		LD	A,63H	
FEB7	BE		CP	(HL)	
FEB8	20E3		JR	NZ,SEARCH	
FEBA	23		INC	HL	is next byte last letter
FEBB	3EE5		LD	A,E5H	and is it "e"?
FEBD	BE		CP	(HL)	
FEBE	20DD		JR	NZ,SEARCH	
FEC0	23		INC	HL	jump over first byte
FEC1	23		INC	HL	
FEC2	7E		LD	A,(HL)	look at sign byte
FEC3	3C		INC	A	jump forward if negative
FEC4	280A		JR	Z,NEG	
FEC6	23		INC	HL	is next byte 1?
FEC7	7E		LD	A,(HL)	
FEC8	3D		DEC	A	
FEC9	2802		JR	Z,ONE	jump forward if it is
FECB	AF	ZERO	XOR	A	trace must be 0 so load
FECC	C9		RET		A with 0 and return
FECD	3E01	ONE	LD	A,1	load A with 1 and
FECF	C9		RET		return
FED0	3EFF	NEG	LD	A,FF	load A with -1 and return
FED2	C9		RET		
			PRINT		
		ORG	OFED3H		
FED3	E5	PRINT	PUSH	HL	save HL
FED4	2II840		LD	HL,40I8H	screen address
FED7	5F		LD	E,A	get print position
FED8	1600		LD	D,0	into DE
FEDA	19		ADD	HL,DE	
FEDB	EB		EX	DE,HL	
FEDC	0600		LD	B,0	
FEDE	21803D		LD	HL,3D80H	character position for '0'
FEE1	79		LD	A,C	get digit in to A
FEE2	87		ADD	A	multiply by 8
FEE3	87		ADD	A	

```
FEE4  87              ADD   A
FEE5  4F              LD    C,A       and put into C
FEE6  00              NOP
FEE7  09              ADD   HL,BC     calculate position in table
FEE8  0608            LD    B,8       there are 8 bytes
FEEA  7E      LOOP1   LD    A,(HL)    pick up bytes
FEEB  2F              CPL             invert byte
FEEC  12              LD    (DE),A    print it
FEED  14              INC   D         next pixel line 256 bytes
                                      further on
FEEE  23              INC   HL        next byte
FEEF  10F9            DJNZ  LOOP1     all 8 bytes
FEF1  E1              POP   HL        restore HL
FEF2  C9              RET
                COUNT & LINE
              ORG     OFEF3H
              PPC     EQU   5C45H
              PRINT   EQU   OFED3H
FEF3  0E00    COUNT   LD    C,0       set counter to 0
FEF5  OC      LOOP2   INC   C         increase count each time
                                      through loop
FEF6  A7              AND   A
FEF7  ED52            SBC   HL,DE     perform subtractions
FEF9  30FA            JR    NC,LOOP2  repeat till past 0
FEFB  0D              DEC   C
FEFC  19              ADD   HL,DE     and difference back
FEFD  1802            JR    JUMP      jump over vector
FEFF  2D              DEFB  2DH       the vector (FF2D is
                                      MAIN)
FF00  FF              DEFB  OFFH
FF01  C9      JUMP    RET
FF02  2A455C  LINE    LD    HL,(PPC)  pick up line number
FF05  11E803          LD    DE,3E8H   a thousand
FF08  CDF3FE          CALL  COUNT     how many thousands
FF0B  3E01            LD    A,1       first digit
FF0D  CDD3FE          CALL  PRINT     print it
FF10  116400          LD    DE,64H    now hundreds
FF13  CDF3FE          CALL  COUNT
FF16  3E02            LD    A,2       second digit
FF18  CDDEFE          CALL  PRINT
FF1B  110A00          LD    DE,0AH    tens next
FF1E  CDF3FE          CALL  COUNT
FF21  3E03            LD    A,3       third digit
FF23  CDD3FE          CALL  PRINT
FF26  4D              LD    C,L       now the units
FF27  3E04            LD    A,4       fourth digit
FF29  CDD3FE          CALL  PRINT
FF2C  C9              RET
                MAIN
              ORG     0FF2D
              PPCH    EQU   5C46H
              TRQ     EQU   0FE90H
              LINE    EQU   0FF02H
              TROFF   EQU   0FE87H
FF2D  FF      MAIN    RST   38H       carry out normal inter-
                                      rupt routine
FF2E  F5              PUSH  AF        save A & F
FF2F  3A465C          LD    A, (PPCH) is a program running?
FF32  3C              INC   A         PPCH holds FF if not
                                      running a program
FF33  2002            JR    NZ,RUN    jump if it is
FF35  F1              POP   AF        restore flags and
FF36  C9              RET             return
FF37  C5      RUN     PUSH  BC        save all regs
FF38  D5              PUSH  DE
FF39  E5              PUSH  HL
FF3A  CD90FE          CALL  TRQ       check variable trace
FF3D  3D              DEC   A         if A not 1 then jump
FF3E  2005            JR    NZ,NOTON  forward
FF40  CD02FF          CALL  LINE      perform trace
FF43  1806            JR    RTN       jump to return
FF45  3C      NOTON   INC   A         is trace 0? If so then
FF46  2803            JR    Z,RTN     just return
FF48  CD87FE          CALL  TROFF     disable trace
FF4B  E1      RTN     POP   HL        restore regs
FF4C  D1              POP   DE
FF4D  C1              POP   BC
FF4E  F1              POP   AF
FF4F  C9              RET             return to BASIC
```

switch trace off but leave it enabled. '1' will switch trace on. So if in your program you wish to trace through lines 300 to 700, say, insert in your program at line 299 LET trace = 1. Line 70I — LET trace = 0 — stops the trace. Then run the program.

The next routine **TRQ** searches the variables area to see if the variable trace exists. If it does not then it assumes a value of 0. If it does exist then the value is picked up. The method of finding the variable is to search through the variables area for the code 0B4H which is the code for 't' adjusted to show that it is the first letter of a long name variable (see page 167 of the manual, letter code 96 + 160). When the code is found each of the codes in turn is checked against the letters 'r', 'a' and 'c' finally against 0E5H which is the code for 'e' + 128, showing that it is the last letter of the name.

The value of a number is stored in five bytes. The first is 0, the second the sign byte holding 0 for a positive number and -1 for a negative. The routine first picks that byte and adds one to it. If the answer is 0 then the A register is loaded with FF (-1) and a return to the main control routine is effected. If it is not negative then the next byte is looked at. That is the least significant byte of the value, i.e. x−256* INT (x/256). The byte is picked up and decreased by one. If the answer is 0 then it must have held 1 and so A is loaded with 1 and a return made. The only possible remaining value is 0 and so 0 is put into A and then the program returns to the main control.

There are, probably, easier methods of doing this, for example using the LOOK-VARS routine in ROM at address 28B2H, but it is important not to alter any of the system variables or the alternate register set because the processor is in the course of running a Basic program. Consequently no ROM routines at all have been used but only simulations of them.

Now type in TRQ and save it under that name. The start address is FE90.

The **Print** routine is the one that prints out the line number. Again there would be easier ways of doing it, using RST IOH for example, but again a simulation has been produced. The routine is entered with 'C' holding the value of the digit and 'A' its position — 1 for thousands, 2 for hundreds etc.

Every character printed on the screen consists of eight rows of eight pixels. Each row can be represented as one byte. As the screen is 32 bytes wide it

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Spectrum Interrupts

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would seem that the easy way to print a character is to poke the first byte in and then the next byte 32 bytes further on and so on. The problem is that the screen is not laid out in memory in that simple and obvious way. In fact, each row of pixels is 256 bytes away from the last one. The algorith therefore requires that each byte is poked into an address 256 bytes on from the previous. The pixel bytes are stored at an address pointed to by CHARS + 256 and the numbers start 128 bytes further on. As there are eight bytes for each character then the value in C must be multiplied by eight and then added to that base address.

The routine may now be typed in and saved using the name "print". The start address is FED3.

The next two routines are involved in sorting the current line number. **Count** divides the number in HL by the number in DE and returns the result in C and the remainder in HL. **Line** picks up the line number and uses Count to manipulate it digit by digit and then prints those out by calls to Print. The current line number is held in PPC so that is first picked up in HL. DE is loaded with 1000 and then Count is called to see how many thousands there are. The number is printed using A to say the print position i.e. the thousands column. Then that is repeated for the hundreds and so on. Count overlaps the interrupt vector at FEFFH and there must be a jump just before it so that the processor does not interpret the vector as instructions.

The start address for this pair of routines is FEF3. They can be typed in and saved.

The final routine is the control routine called **MAIN** and it controls all the others and performs the necessary housekeeping tasks. The start address is FF2D; the one held in the interrupt vector FEFF. It is the routine called when an interrupt occurs.

The first task is a call to ROM address 56. That is the normal interrupt routine and it updates FRAMES, reads the keyboard and so on. Next the A register and the Flags register are saved so that normal service can be resumed on return. If a program is not running it will hold FF(-1) and then a return is made after restoring A and the flags register. If a program is running then the registers are saved and a call made to TRQ to see if the trace is to be switched on, off or disabled. TRQ return that information in the A register. Depending on the value in that register a call is made to LINE or TROFF or none of those. Finally, all the registers are restored and control is returned to the ROM. All that remains is to collate all those routines. Type in the second Basic program in listing 3, rewind the tape and then run it, not forgetting to save MAIN first.

The third Basic program — listing 4 — will load the trace utility above RAMTOP. It, or something like it, must be used on switching on and before you load or type in the program under test. To enable the trace, i.e. to call TRON, you need to give the command RAND USR 65150 after any start or NEW.

Further sophistications can be added, such as a delay loop at the end of MAIN which will make it easier to follow the trace.

Listing 3: Collator

```
 10 CLEAR 65419
 20 FOR n=0 TO 4: LOAD ""CODE :
NEXT n
 30 CLS : PRINT "Prepare tape f
or saving  Press  ENTER"
 40 PAUSE 4e4
 50 SAVE "trace"CODE 65150,214
 60 STOP
```

Listing 4: Trace

```
 10 CLEAR 65149
 20 LOAD "trace"CODE
 30 NEW
```


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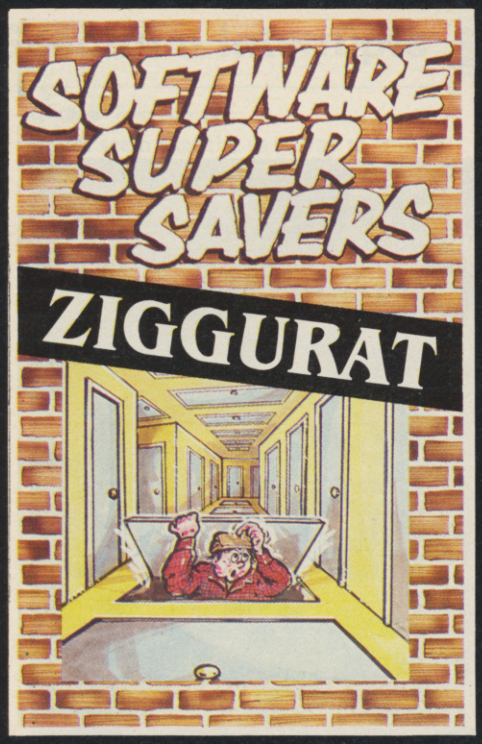

Lured by the promise of untold riches, our intrepid hero enters the temple of Ziggurat, a place of ill legend. All he has to do is grab the money and run, but he can't quite remember which way he came in, and what is that shuffling sound coming from the crypt.
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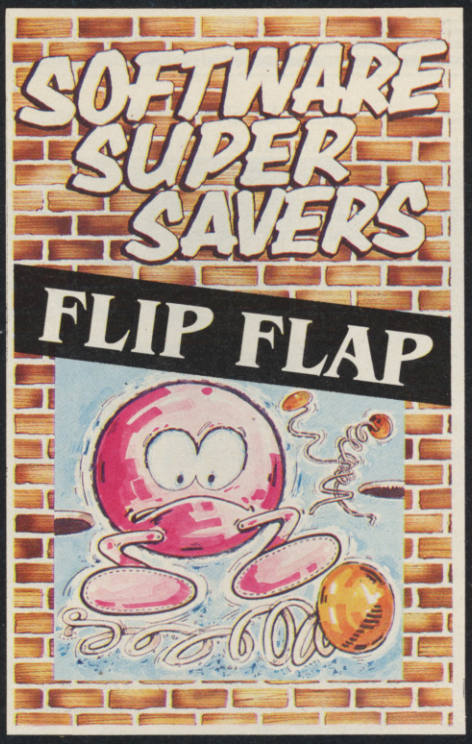

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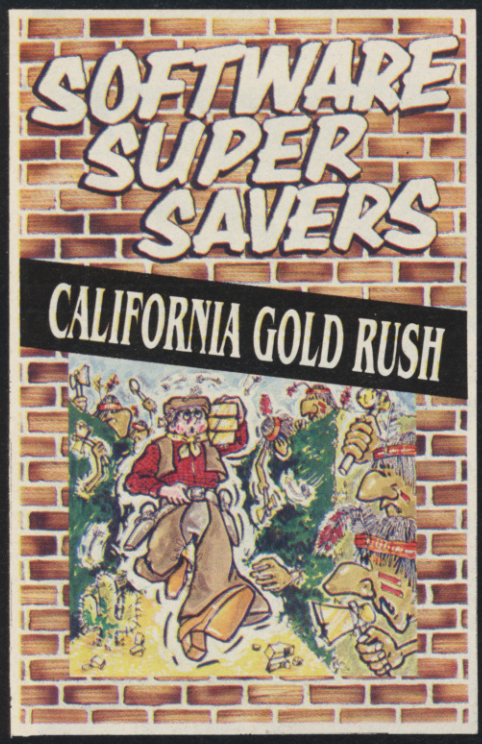

In the heart of hostile Indian Country, prospector Jake has discovered a fabulous fortune in gold, spread out in 24 rich fields. To claim these riches he has to fence off each mine. The Indians, alas, have other ideas, tearing down his fences and attacking him with arrows and tomahawks. Can Jake block the Indians with carefully placed sticks of dynamite and stake his claim to the fortune.
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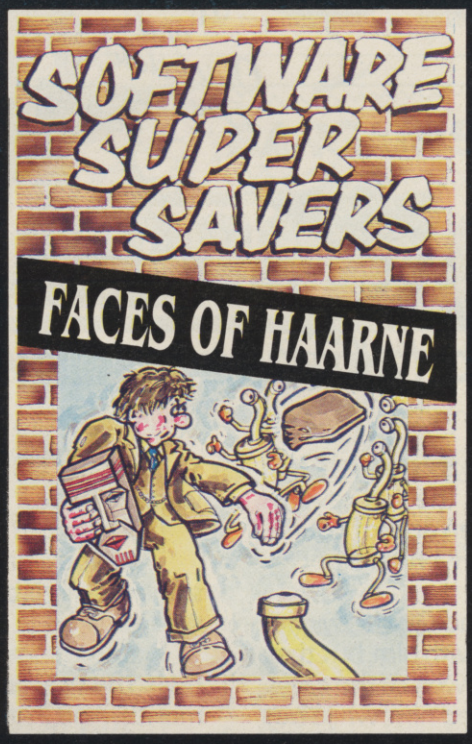

Night falls over the city and at the local museum Herbert the curator is doing his rounds. As he approaches the Green Room containing the mysterious and fabulously valuable "Faces of Haarne", strange noises can be heard from within. Armed with his steel-rimmed "Odd-Job" hat, Herbert enters the room. You won't believe what he encounters!
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are the Commander of a Space
ttle ferrying cargo to Arcturus and all
nets north. Whilst checking the
ntory, which includes Mega-Tennis
ls, Clockwork Oranges and Intoxo-
erages, you hear some very peculiar
nds coming from the hold. Dare you
estigate?
ilable on 48K Spectrum.

gemon the astronaut has crash-landed
the planet Epsilon XI and the power
ks that propel his rocket have been
persed around the planet. Algies
orts to re-assemble his power packs
hindered by some rather eccentric
forms; stinkers, mutant lawn
wers, grandfather clocks?? What kind
planet is this?
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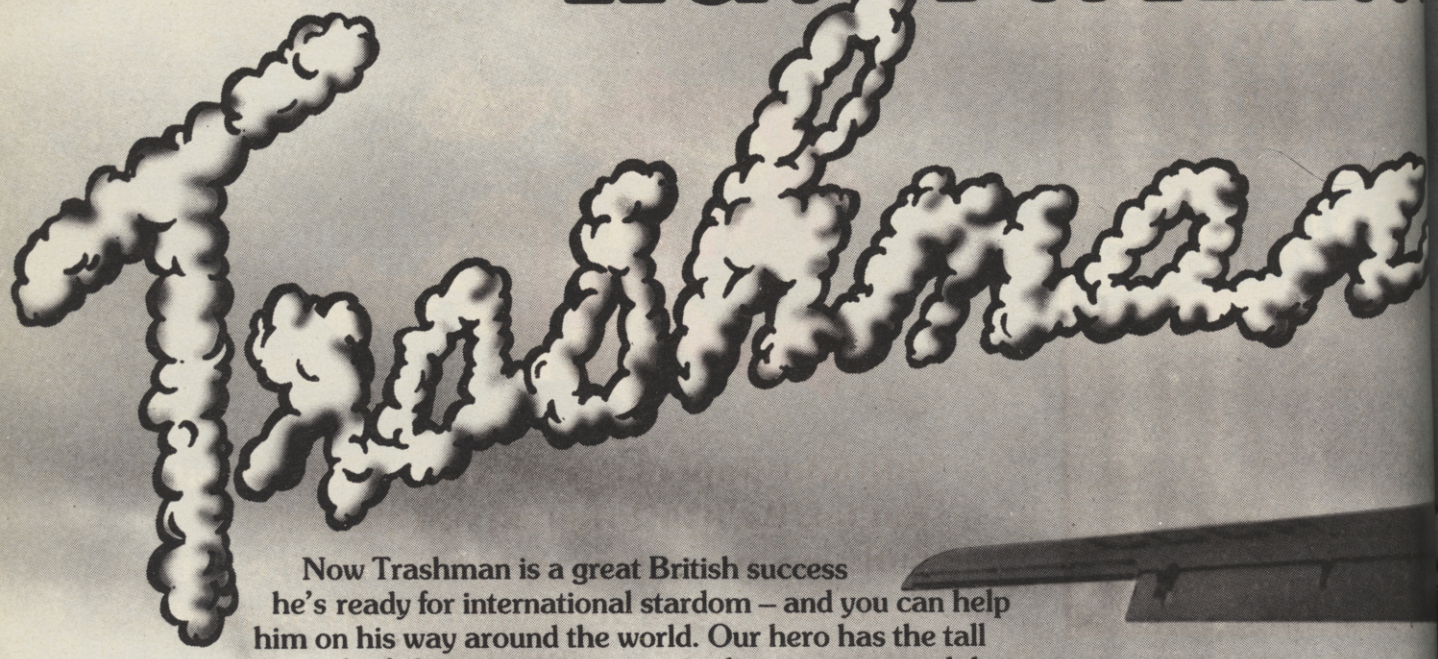

Now Trashman is a great British success he's ready for international stardom – and you can help him on his way around the world. Our hero has the tall order task of cleaning up every major litter spot around the globe. Scooping up flowers thrown into the bull ring by matador fans in Spain, collecting the tissues of the faithful as they sob by Jerusalem's Wailing Wall, picking up coconuts from a palm beach in Samoa and collecting the empties at the German beer festival (Trashman still likes his tipple!) are just some of the challenges that make up Trashman's task.

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Examine the brief extract opposite from the diary of an unfortunate explorer who failed to defeat the evil Vran and his high priestess, Delphia. Hidden in the extract is a mathematical expression. Write the answer, which is a three figure number, on a postcard together with your name, address and telephone number. Post it to: Ket Trilogy Competition, *Sinclair User,* EMAP Publications, 67 Clerkenwell Road, London EC1R 5BH, to arrive not later than Friday November 16. The first 100 correct entries pulled from the bag after that date will win the presentation packs.

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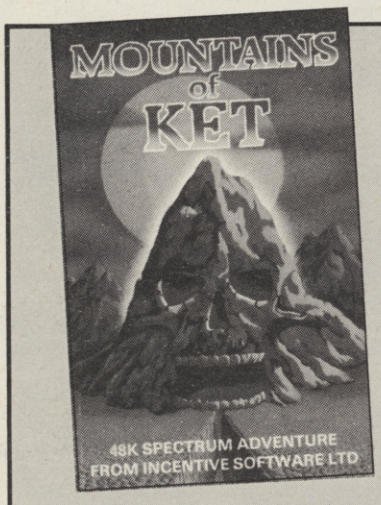

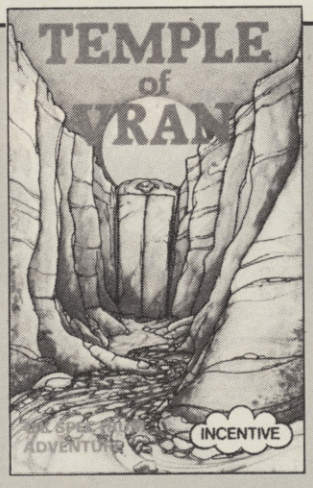

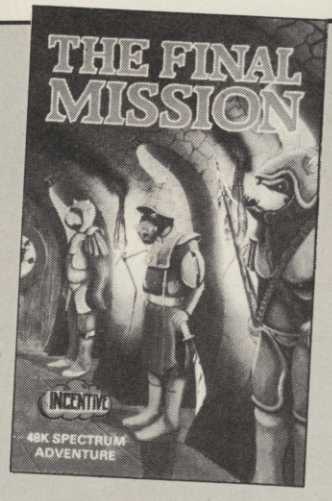

The Ket Trilogy

UNJUSTLY condemned for a murder you did not commit, you have been offered the chance of escaping the hangman's noose by undertaking a perilous quest. You must seek out and destroy the evil Delphia and Vran Verusbel, priestess and leader of the cult of the mad monks.

The quest spans three adventures, **Mountains of Ket, Temple of Vran,** and now, completing the long haul, **The Final Mission.** In the first you must travel to the Mountains of Ket, and then underground, fighting monsters as you go. Once through the mountains, the second part begins, in which you must seek the temple of the cult of the mad monks and destroy it.

The Final Mission, only recently released, brings you to the ultimate showdown with Vran himself, penetrating his inner sanctum beyond the Guardians of the Gate. All three adventures will be available in the shops in a presentation gift pack costing £12.95, but you have the chance to win them for free in this *Sinclair User* competition.

There is a rather more substantial prize awaiting the lucky adventurer who manages to complete the whole of the trilogy. Incentive Software is offering £400 worth of video equipment to the first player to decipher the hidden message, one part of which is revealed at the end of each program.

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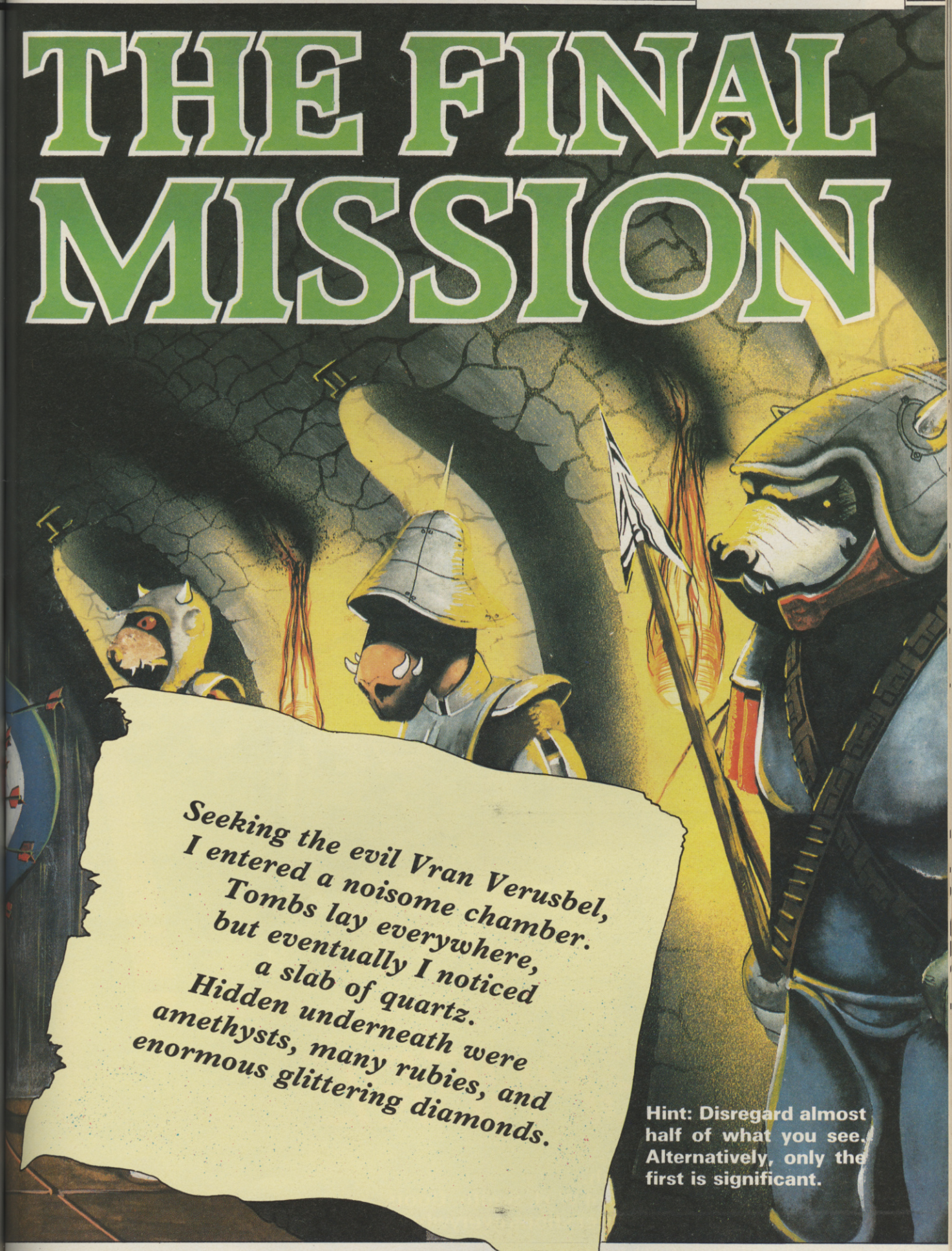
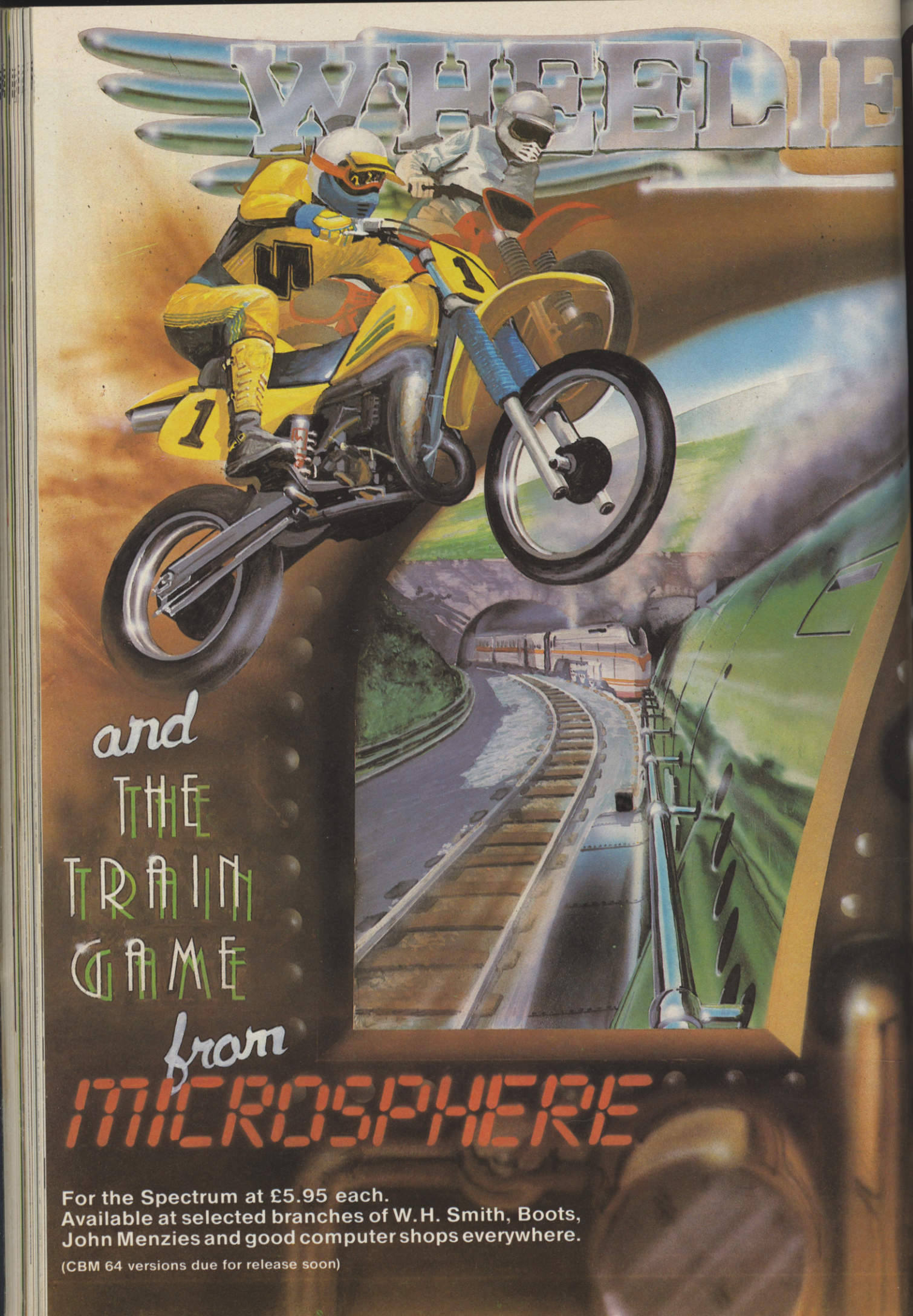
THE FINAL MISSION



Seeking the evil Vran Verusbel,
I entered a noisome chamber.
Tombs lay everywhere,
but eventually I noticed
a slab of quartz.
Hidden underneath were
amethysts, many rubies, and
enormous glittering diamonds.

Hint: Disregard almost half of what you see. Alternatively, only the first is significant.



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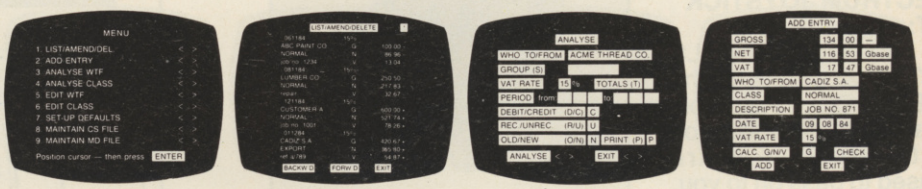

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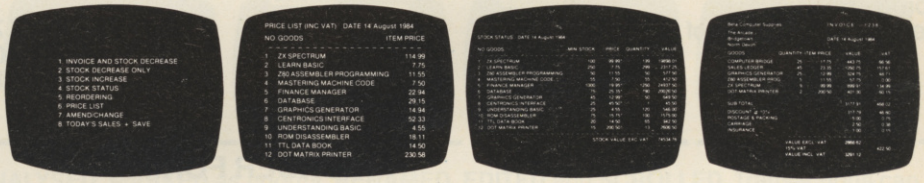
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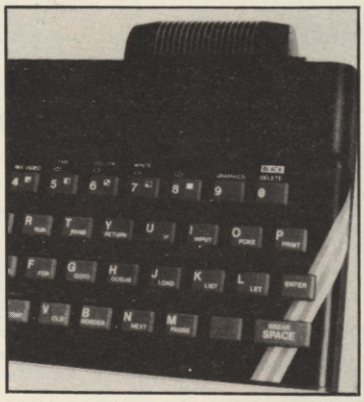

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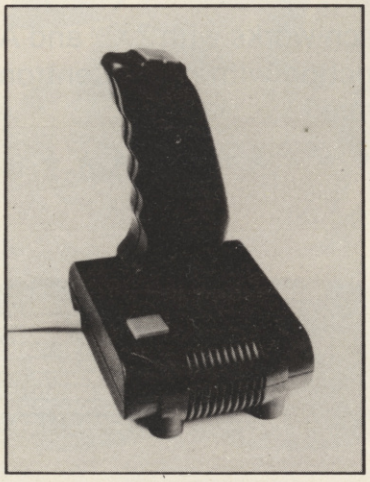

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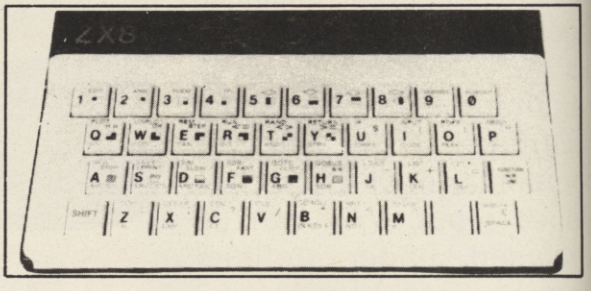

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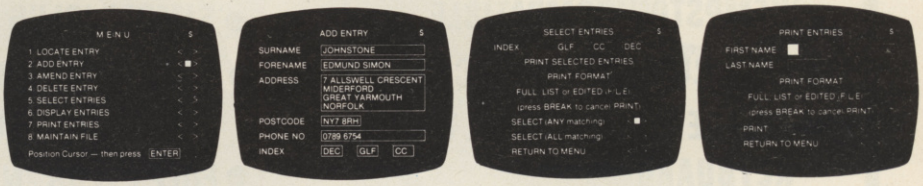

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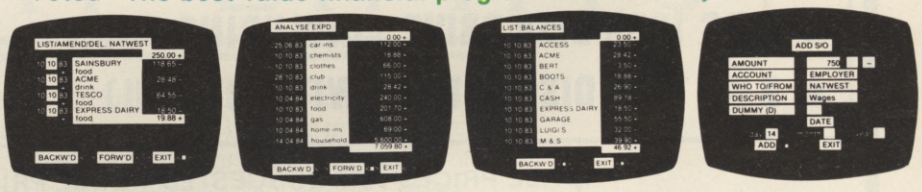

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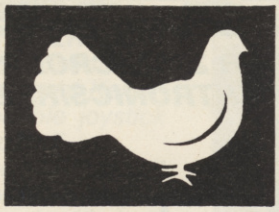

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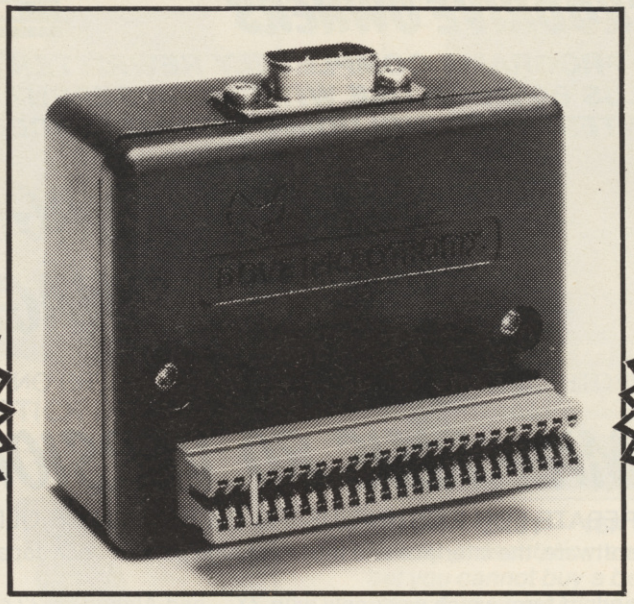

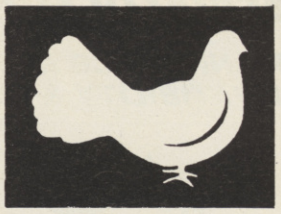

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Flying low

Chris Bourne talks to Costa Panayi, laid back pilot of TLL

IN contrast to the concept of whirling motion suggested by its name, Vortex Software is as laid-back an outfit as you are likely to find in the frenetic software industry.

The company is very much a family business. Brothers Costa and Crete Panayi handle programming and advertising respectively while brother-in-law Luke Andrews concentrates on administration and finance. Greek Cypriots by ancestry, the strong emphasis placed in Greek culture on family ties and loyalty serves the brothers well in their business enterprise.

The founder of the company was Costa, the programmer. As often happens in the industry, the other brothers were brought in later as the operation grew more professional and required their particular talents.

Costa's first introduction to programming was at the University of Salford, where he took a Fortran course as part of his degree in Mechanical Engineering. At first Costa was more interested in the machinery than the programming of computers, and wanted to buy a kit. "I fancied a UK101, but I couldn't afford it. Then the ZX-81 appeared, and as soon as I saw the ad I ordered it. I had to wait three months before it arrived."

By now Costa was working as a design engineer for British Aerospace, and a number of his colleagues at work were also excited by the new machine. "We had bets on which one would arrive first. Mine was last. There were about half a dozen of us, and we swapped programs at work."

It was on the ZX-81 that Costa learned Basic, and the first few programs he wrote were in collaboration with his friend at work, Paul Canter. They sent off their first tape to Michael Orwin, of Orwin Software. "It was a collection of programs, Mastermind, Pontoon, Othello and Awari. We were quite chuffed. You wouldn't believe it, he's still sending us money."

At the time, however, Costa had no intention of quitting design engineering, his chosen career. Besides, he was still learning how to program, teaching himself machine code from books.

"The 1K machine was really useful for learning how to be efficient. To begin with it was difficult to see how you could write games."

Costa began by writing routines instead, mainly connected with screen displays. The scrolling techniques he developed were later used in **Cosmos,** now known as **Astral Convoy.** He and Canter set up Vortex Software and decided to sell it themselves.

The timing was atrocious. Suddenly the Spectrum appeared on the scene and sales of Cosmos went flat as pitta bread. They quickly converted the game to the 16K Spectrum, including sound and colour features, and, deterred by their initial experience, licensed the game to another company.

Costa then began work on **Android One,** and it was at that time that his brother-in-law Luke became involved. "It was a natural progression for Vortex," Luke explains, who is a craft teacher. "I'd handled money working as a teacher and I used to have my own furniture-making company." Crete Panayi had already helped Costa with the advertising side, drawing on his experience working for an advertising agency and his knowledge of design.

Costa's games can easily be seen as a progression of ideas, developing concepts from game to game. The original scrolling technique developed on the ZX-81 in 1K have formed a major feature of all Vortex games, along with other ideas such as 3D effects and large playing areas. Although the original routines are no longer recognisable in the latest products, the development of the style has been a continuous process.

"For Android One we tried to produce a game with a lot of features. We used the scrolling techniques to produce a long corridor, and designed a few rooms, then tried to get something running about the screen." It seems a slap-happy technique to design a game while writing it, putting together chunks of old routine and working out the possibilities, but that is one view of the process by which Costa writes games. "We try to look at the trends" he says. The idea for **TLL** came simply from the popularity of **Flight Stimulation,** although the game bears no resemblance whatsoever to the Psion program.

Android One became a popular success, and was accepted for retail by W H Smith. The sequel, **Android Two,** takes the action further using a considerably expanded playing area. The object of the game is to move around a maze-like park destroying blue millipoids.

"I wanted to do a sequel which had something special about it. That's why

I developed the 3D effect. It was our first 48K game, and took me 9 months to write. It was released just before Christmas 1983."

Nine months is an enormous length of time to produce an arcade game, but it must be remembered that all the time Costa was still working for British Aerospace. The game itself caused problems, as the ideas Costa was putting into practice were highly ambitious.

"The game became so complex" he says. "The millipoids caused problems. Most people use dark backgrounds but we decided to use the BRIGHT colours. The other thing was the wraparound maze."

The long haul was certainly worth it. Lurid is the only word to describe those background colours—there is an almost tangible feeling of poisonous heat about the game.

"I was tempted to do **Android Three,**" says Costa laconically, threatening further horrors in his metal world of mayhem. "But I decided to leave it for another day."

"TLL is really a progression of the ideas in Android Two. I expanded on the 3D landscape, making the wraparound more complex. There is an extra dimension as the plane isn't always on the ground."

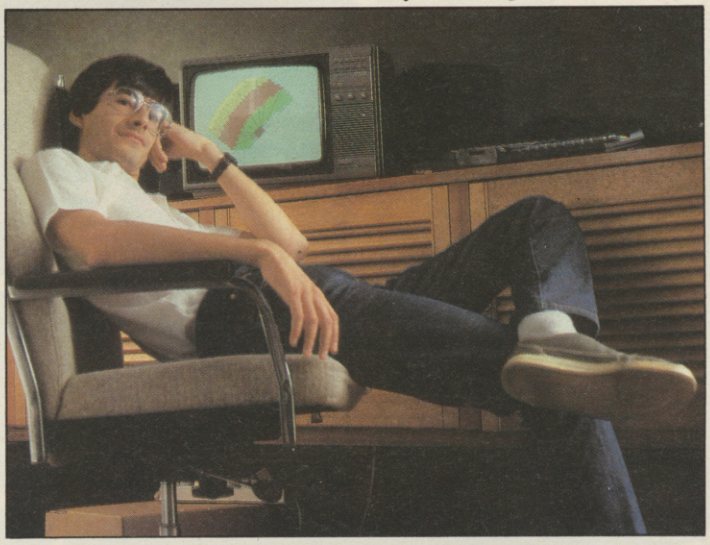
TLL was one of the big hits of the summer, with superb graphics of buildings. "It's easier to get into TLL than Android Two" suggests Luke Andrews. "My best score is 34,125. We always like to make each game something of an adventure. There is a sort of Vortex cult. For instance, we don't tell you everything about TLL on the cassette insert."

An example of that is the fact that you can fly under bridges and telephone lines in TLL, which at first simply look like obstacles to be avoided. The first time you go under the bridge the 3D aspect of the game really opens up and you see the plane duck under and out of the other side. Costa himself is particularly proud of the shadow which the plane casts. When you fly over a building the shadow climbs up the wall, which, if you think about it, means suddenly it has to move faster than the plane to keep up. "It took a bit of doing that," says Costa, smiling quietly.

The brothers are a quiet spoken trio and Luke is very sanguine about the problems suffered by the software industry of which we read so much in the computer press.

"Garages are going bust all the time" says Luke. "People don't mention that. Software houses have matured a great deal, but we still regard ourselves as beginning. If we haven't got the money for something then we don't do it. We haven't drawn a penny out of the account yet for ourselves."

That situation is likely to change in the near future as the company plans to move into a real office—at present it still operates from the front room of Luke's house in a leafy Manchester suburb. Costa left British Aerospace earlier in the summer to devote himself full-time to programming, and thus will require a living from the business.



Vortex has appeared to be happily isolated from some of the problems faced by other companies, partly because of its policy of never borrowing money, and partly because it has released so few titles and yet managed to sustain a loyal following. "We can't be doing too badly" says Luke. "People tell us we're in a slump. Yet in this depressed period TLL has consistently been in the top five since its release. Too many people say it's a seasonal thing, but people still want software in the summer."

If Vortex as a business takes few risks and aims for consistency of quality rather than a high profile and a galaxy of quick-money instant games, Costa himself takes risks of a different kind. "A guy at work in his early sixties did a parachute jump and then put up a notice daring everybody else to copy Granddad," he explains.

Costa and a group of friends went to Langer Airfield in Nottinghamshire, home of the British Parachute School, to try their hand. "The first jump was over a weekend, you get a day's training and then you do your jump on the Sunday. Once that's done you try to get as many as you can in order to be able to go freefall."

"I've never seen him so enthusiastic about anything before" says Luke. "It's a fantastic sensation" says Costa, and goes into reveries about the joy of jumping out of aeroplanes. Wasn't it just a bit scary? "The night before the first jump was worse" says Costa. "But once you've got your kit on you don't think about it."

Costa is unlikely to be getting much time for parachuting over the next few weeks, as he is busy working on the new game, **Cyclone.** The promised move to a new office will therefore be delayed until the game is completed, so it is likely to be one of the last programs Costa writes by himself, as the new plans include creating a design team to work around him, producing two or three games a year for arange of machines. That may seem a small quantity, but it is more than Vortex has been producing over the past three years.

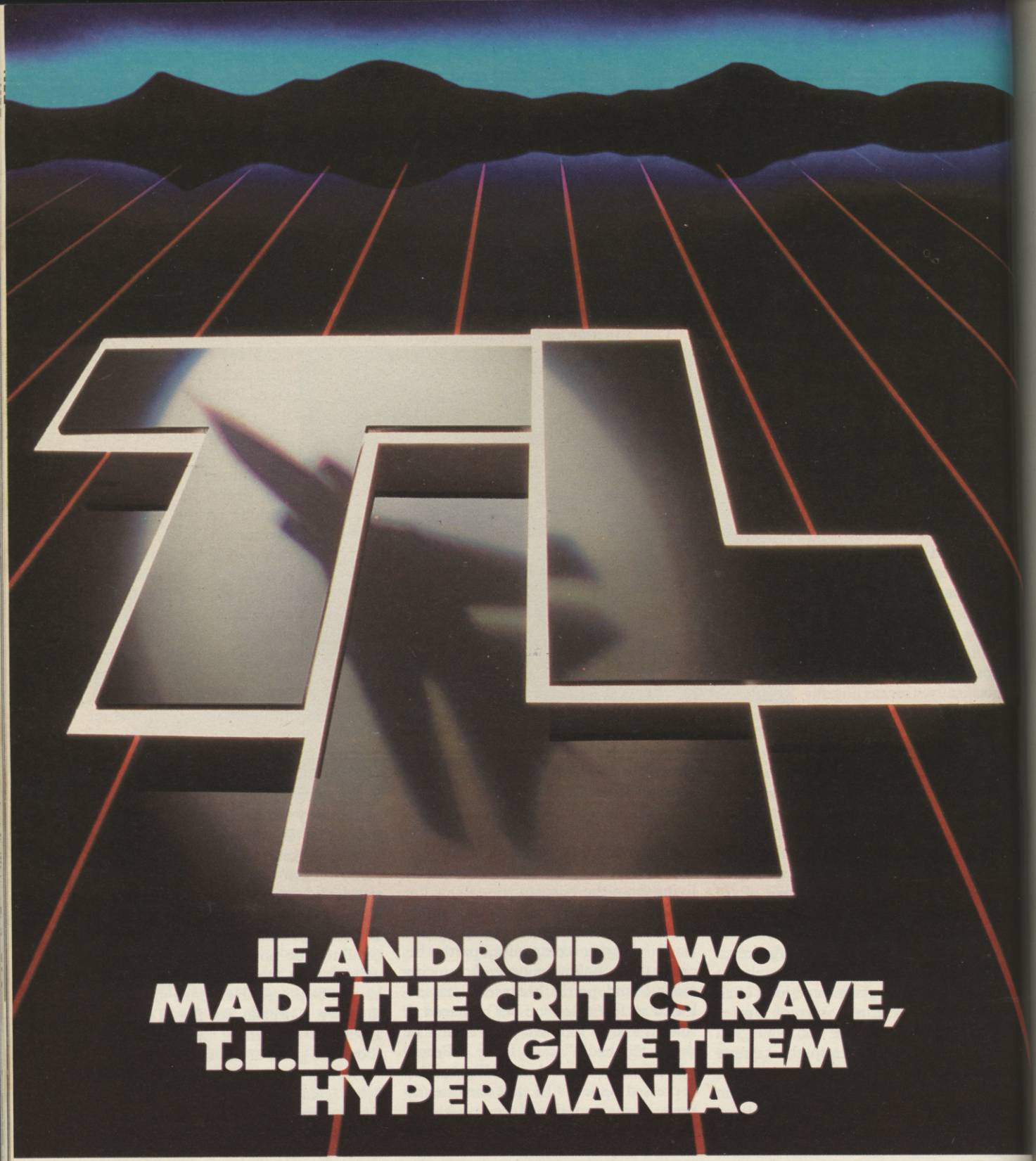
The way the games are created, with nobody at all sure what Costa's final version is going to involve until it happens, means that the team is understandably reticent about describing Cyclone. Luke explains that even the advertising causes problems, as they genuinely do not know what the game will include when the advertisements have to be placed. Hence the mysterious shadowy Tornado in the TLL ads, about the only thing that was certain about the game at the time.

Cyclone however will be another flying game, but with a much bigger playing area than TLL.

"Watch out for innovations" says Luke, mysteriously. "I can guarantee that. And the weather will play a central part."

Jim Bacon meets the space pirates? Michael Fish versus Pacman? At any rate, the game is due to be released at the end of October, and Vortex is certainly looking for a Christmas hit with Cyclone.

It seems that while the gales blow around them, and other businesses rock and even crumble under the force of 'natural market pressures', Vortex stays cool — the calm spot at the centre of the whirlwind.



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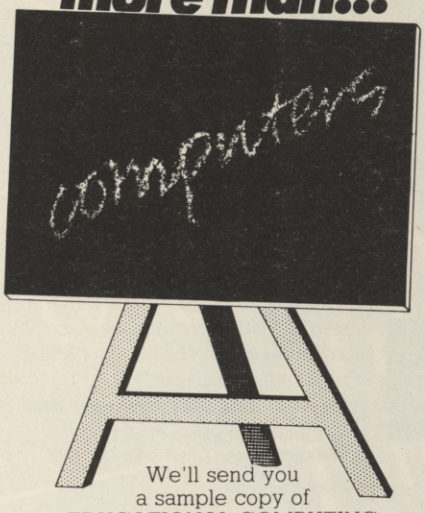

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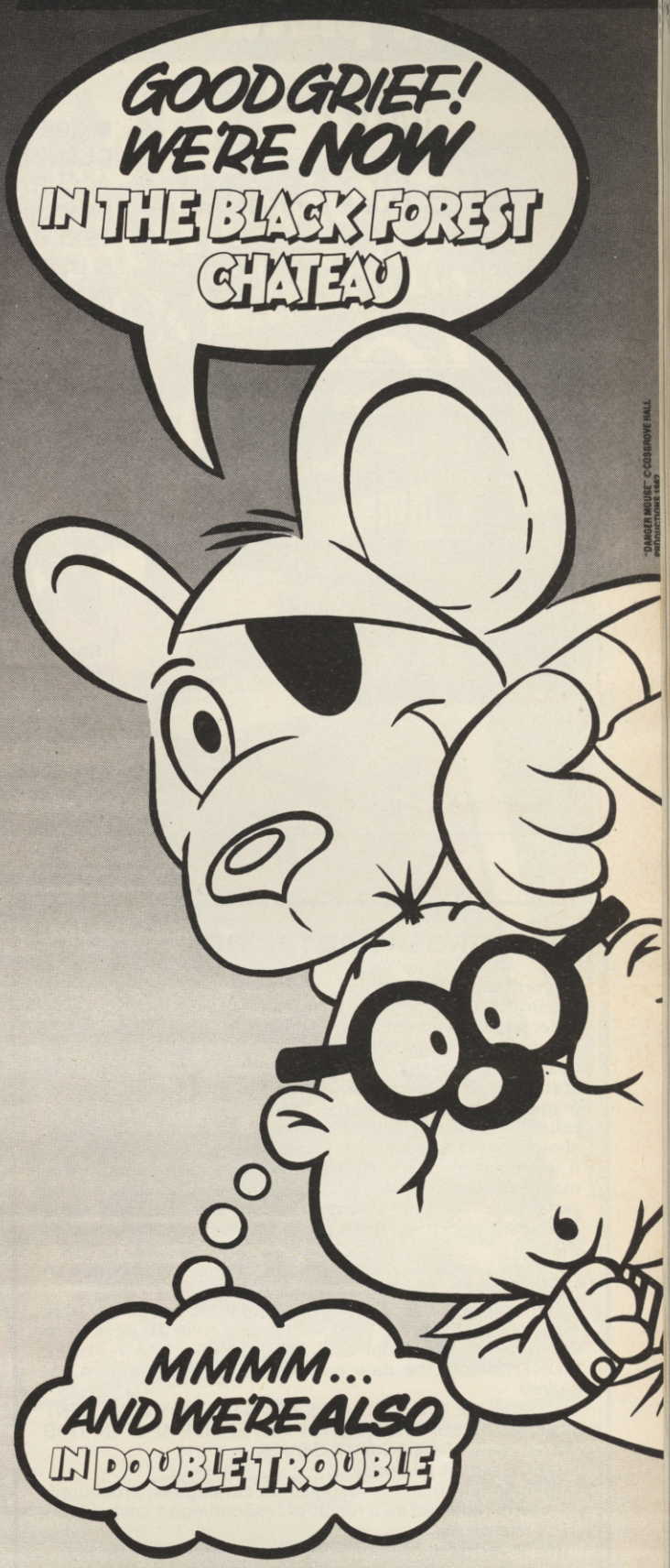

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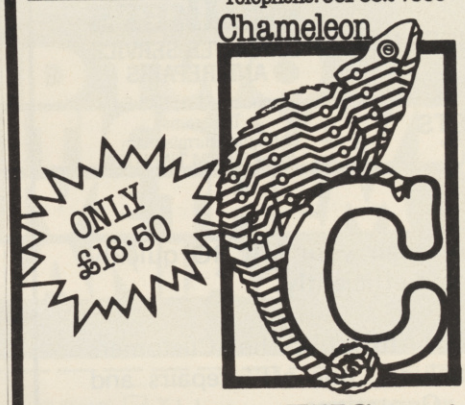

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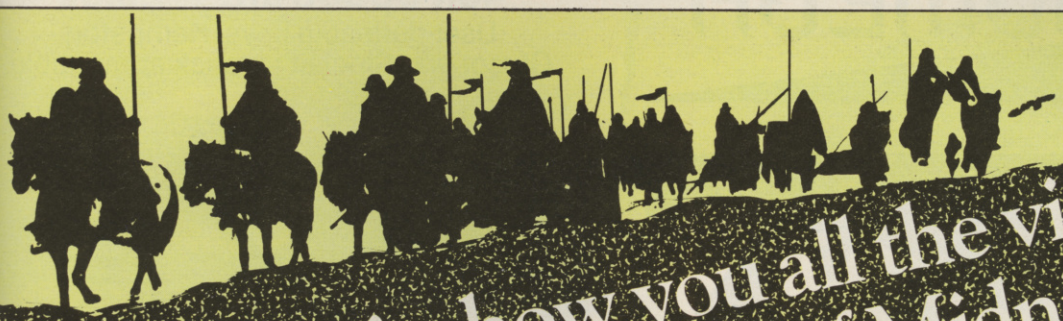

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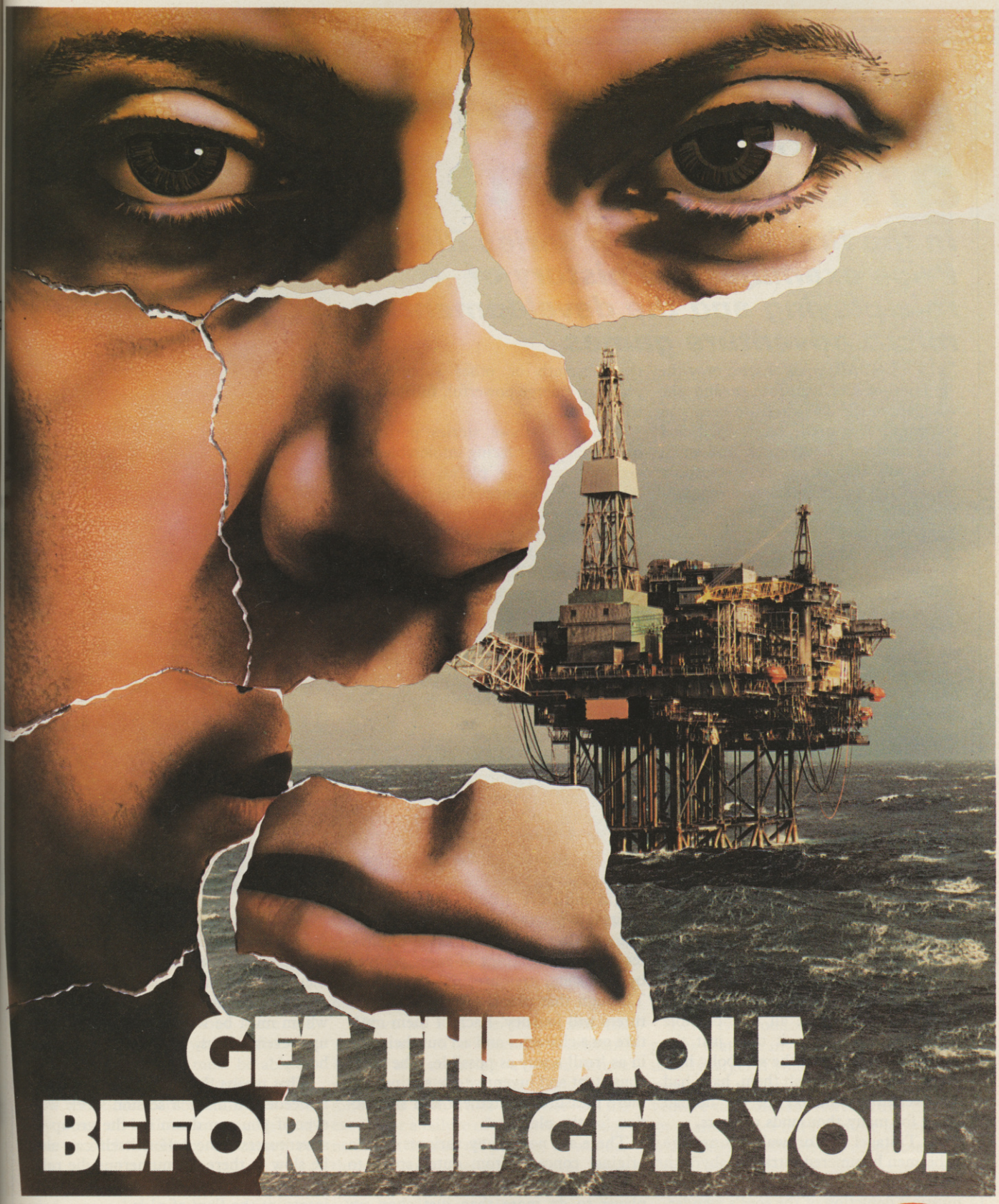

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In the first of a regular series Richard Price examines the history of role-playing and the development of micro adventure games

IT IS NEAR DAWN with only the hum of the transformer and the glare of the TV screen to keep you company. Dog-tired, bleary-eyed and suffering from severe back and brain strain you desperately try to escape a band of roving cannibal orcs amongst the dungeons of a menacing fortress. Your computer is overheating and it seems like a week since you last slept but you cannot give up now. You want to be a hero and the real world can just wait until you have managed it.

Recognise yourself? If you do, then you know you are an adventure addict, hopelessly hooked on the multiplicity of fantasy worlds that the computer can offer for exploration. That jumble of wiring and chips can transport you into the far future aboard a giant spaceship or to medieval worlds where magic and myth rule.

To survive in those places you will need a crossword puzzler's mind and be able to solve complex logical problems by a mixture of luck, cunning, planning and lateral thinking. Computerised brute force will come in handy too when your luck dribbles away and you are face to face with some fire-belching dragon.

It is easy to think that computer technology has made all that possible but there is more to it than just the machine. Mazes, and the symbolic hazardous journey through them, have had a powerful fascination for the human mind for many thousands of years.

At Tintagel in Cornwall, bronze age tribesmen hammered intricate labyrinth patterns into the rocks, perhaps as some mystical depiction of the soul's wanderings from birth to death and back again. Before them the first farmers decorated the huge stones of their communal tombs with swirls of interlocking lines and spirals. Dancing mazes cut into the turf still survive in a few places around the country and, all over the world, there are myths and legends of heroes and heroines overcoming the terrors of the labyrinth or other subterranean places to emerge powerful, fulfilled and triumphant.

Almost all those stories portray a human character facing intolerable danger in threatening places, often lost, often afraid, but succeeding through his or her wit and persistance. Maybe the ordinary, small person has always needed such fantasies as a welcome escape from the humdrum reality of everyday life. With the machine's help it is now possible to enter the unknown and make your own decisions about how the story should develop. No longer a passive listener or spectator, you can become Theseus, Bilbo Baggins or Sherlock Holmes for a day and still get back in time for your beans on toast.

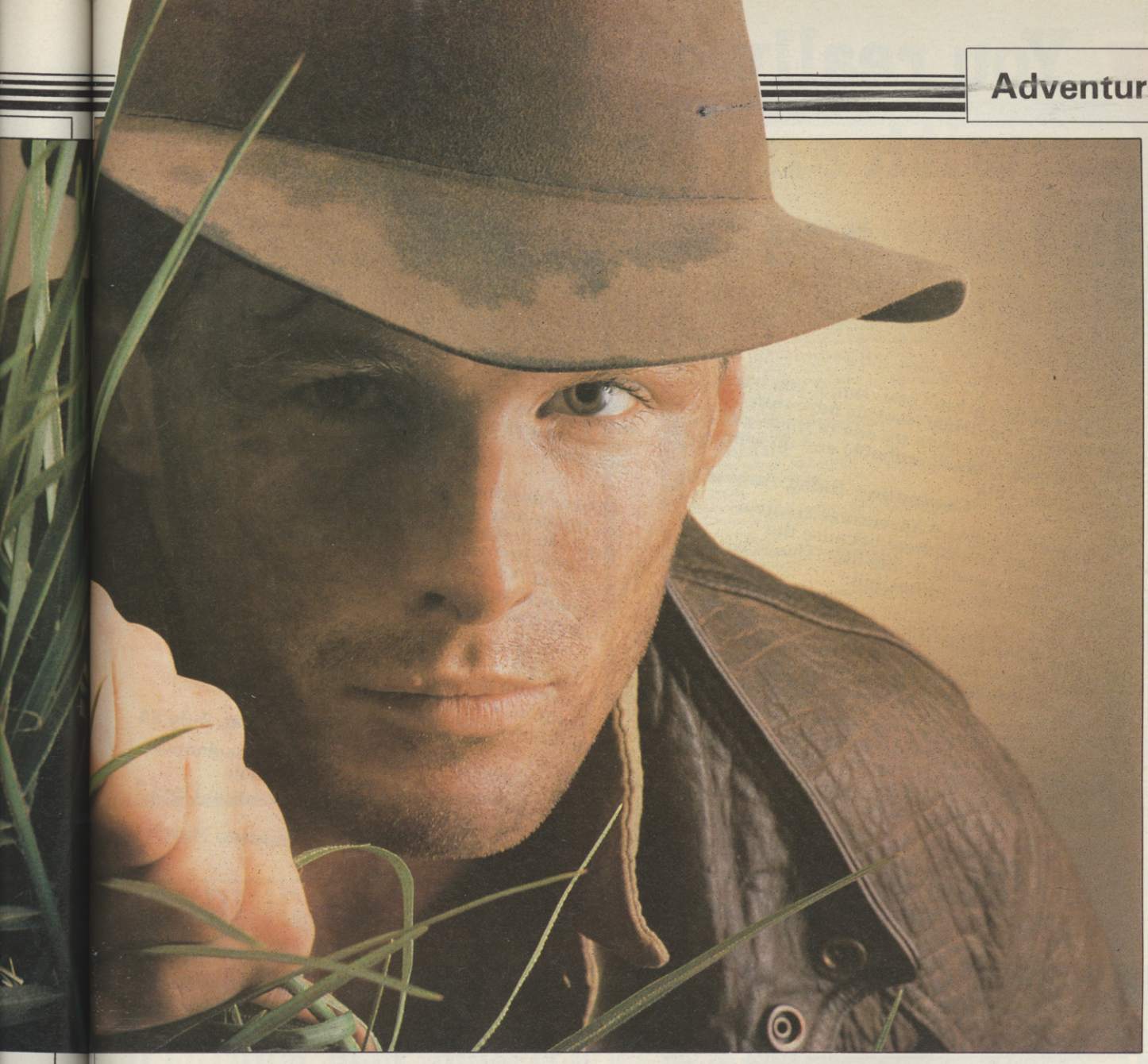
Most people would accept that JRR Tolkien is the father of modern fantasy writing and his plots and terminology run through many of the games that use magical or heroic worlds as their setting. His themes, combined with wargaming rules, were adapted by Gary Gygax and Dave Arneson as the basis of their role-playing game *Dungeons and Dragons*. In that system a Dungeonmaster designs a complex of caves peopled by monsters, treasure and magicians. Through that place, a party of adventurers will journey. Each of them must take on a character and act out their role in as 'real' a way as possible. The more consistent and inventive the setting, the more pleasure, excitement and satisfaction for the player.

There are now many variants on the original concept, from outer space to Middle Earth, but they all expect the player to do more than just chop up monsters and often demand problem-solving skills and ingenuity. Role-playing games have a vast and dedicated following and their devotees can sometimes seem like members of an esoteric religious cult. Psychologists would claim that the game helps young people to work out their personal problems through safe fantasy.

Absorbing as RPGs are they suffer from a major disadvantage. Creating a dungeon is a painstaking business and the play itself needs the concentrated attention of up to five players all of whom must be willing and able to give up several days, or longer, to their hobby.

That means that a lot of organisation is needed to make a session work well even if you can drum up the group of adventurers. The action itself can also be slow as there are numerous die rolls and consultations with rule books to interrupt the flow of play.

Two computer programmers, Crowther and Woods, translated that sort of single role-playing into computer language and plumbed it into their mainframe. Computer text adventure began with them in the not so remote past of the early seventies. Their original **Adventure** featured a Tolkienesque plot set in a twisting labyrinth with



lots of tricky puzzles and mean monsters. Once Sinclair had pioneered the home computer the field was open for rapid development of the art.

Computer text adventure comes in all shapes, sizes and eras but there are fairly standard features which define the genre. The interpreter must be able to understand some basic English, often just a verb/noun combination and also carry a set of built-in commands and requests, such as Help, Inventory or Score.

Good programs will always possess a varied concealed vocabulary for the player to discover by trial and error. Getting the right words for the right action is one of the trickiest problems in adventure, especially where magic is involved.

Informative location descriptions and a versatile response from the interpreter are very important as they help to set the scene and make the player feel that the computer has a personality, just like the old Dungeonmaster. Most players would also expect the locations to be properly connected so that a map can be made.

Above all else the theme and the setting ought to be internally consistent. If you are exploring a world where magic is possible then that magic should follow its own rules and not be the excuse for a failure of the writer's imagination. It is also off-putting to wander through some heroic medieval landscape and discover an inn with pool tables or similar oddities. Too many unsuccessful programs hurl a jumble of different eras and technologies together.

The arrival of the Spectrum, with its large memory and graphics capability has inevitably meant that adventure programming has become more and more sophisticated and there are many variations on the format currently available. The purists probably will still argue that text-only adventures are the real thing as they don't waste valuable space on pretty pictures and are often good value for money, tending to have more locations and better descriptions.

Level 9 produces a range of text games that are inventive, involved and usually large. If you're keen to try out a version of the original mainframe Adventure its **Colossal Adventure** has a lot of similarities but has more locations and a slightly altered set of problems. Other games by the same company carry on from where that game stops.

Level 9 takes a lot of trouble over the plots and settings of its programs and, if you are after an adventure with a difference take a look at **Snowball.** You will find yourself in a vast interstellar spaceship that has gone out of control. While swarms of colonists hibernate in blissful ignorance of the danger you must explore the ship and find the main con-

continued on page 150

You really can't go wrong with any Level 9 game as they are really brilliant

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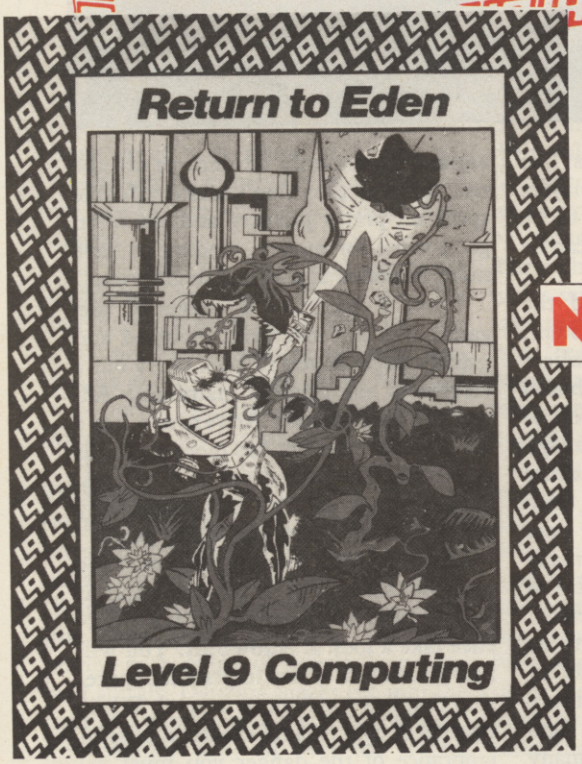

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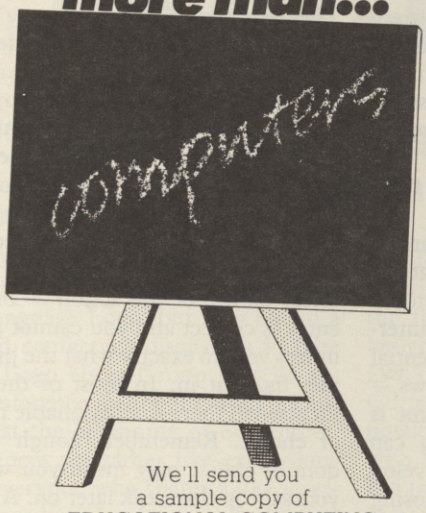

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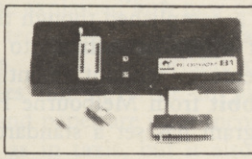

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EPROM ST. ADDR — 0000
JOB LENGTH — 4000
TASK — CHECK

WHICH TASK DO YOU WISH TO DO
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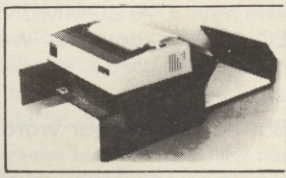

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continued from page 147

trols. Guard robots menace you and the sheer vastness of the vessel means that your task will be long and involved. The technology is very carefully constructed and the design is extremely convincing with over 7000 locations.

If you would rather be a classic, albeit reluctant, hero, the **Ket Trilogy** from Incentive Software provides all the magic and mayhem you will need. **Mountains of Ket** and **Temple of Vran** feature mad sorcerers, battle-crazed orcs and combat routines which help to bridge the games nearer to their D&D ancestors. It is also satisfying that the story continues from one program to the next. The world of Ket is consistent and exciting and is well worth a visit.

Adventures using graphics, either to illustrate locations or to show the action itself, seem to be becoming the norm. Games, however, like **Atic Atac** or **Halls of the Things** are not in that class. Those so-called graphic adventures are little more than glorified arcade games and do not have the features that define proper adventures, exciting and accomplished though they are.

It would be difficult to discuss text adventure without mentioning **The Hobbit** from Melbourne House. That program has set a standard for future adventures with its use of nearly English 'Inglish' and interactive characters who live their own lives while you are busy trying to get out of the goblin's dungeon. A vast range of input is allowed and the variations of possible actions make it seem like ten games rolled into one, though some may find the routine of talking to characters rather tedious at times.

After The Hobbit programmers looked for more and more innovation. **Valhalla** combined animated cartoon-style graphics with a versatile text interpreter and has shown the huge potential of the Spectrum. Despite some flaws — like the occasional crash — the game is open to a number of uses. You can follow the quests if you like or develop your character independently, choosing to be evil or good as the mood takes you. The other inhabitants will respond convincingly to the role you take on and they too will go about their own lives, which of course you can sit back and watch if you do not feel like joining in.

Lords of Midnight from Beyond does not quite fit the adventure description. That immense game with its 3D static graphics, multiple leading characters and strategic planning uses an adventure plot mixed in with wargaming concepts. Armies and allies have to be recruited to defend the world against Doomdark, a Sauron-like sorcerer. The four major characters are guided through the meticulously detailed landscape by the player and there are various ways of defeating the powers of evil. The program is very reminiscent of *The Lord of the Rings* in its theme and you can make the story what you will.

The best adventures are those where a true multiple choice is involved. It is easy to spot a poor program by the linear nature of the action — only one entry is correct and you cannot proceed unless you do exactly what the programmer has put in. In most of the games mentioned there is a reasonable freedom of choice. Remember though — freedom of choice may mean you will find yourself up the creek later on. A bit like real life, in that respect, and that for many is the entertainment in adventure. You will learn from your mistakes, load your saved position and wearily start all over again, but still get a lot of fun and excitement in the process.

The mysteries *of adventures can baffle even the greatest hero or mage at times. If you are having trouble on your travels or have hints and tips to offer fellow explorers we would like to hear from you. Scribe your letter to Richard Price c/o* Sinclair User, *EMAP Business and Computer Publications, 67 Clerkenwell Road, London EC1R 5BH.*

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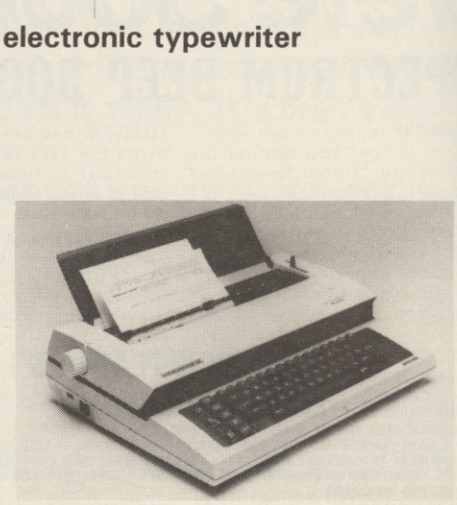

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Mindstorming

Theo Wood talks turtle at the Logo Conference and listens to blunt-speaking guru Seymour Papert

LOGO USERS are a special breed of enthusiasts; not only are they deeply involved with the computer language Logo, but they attend a weekend conference discussing it. The British Logo Users Group held its annual conference at Loughborough University at the beginning of September. Conferences are rather like exhibitions where everyone who shares a like interest can see both hardware and software and catch up with all the latest developments. Conferences are also the venue in which much discussion can take place as to the relative merits of the goods on offer, and an opportunity to hear experts expound their views in greater detail.

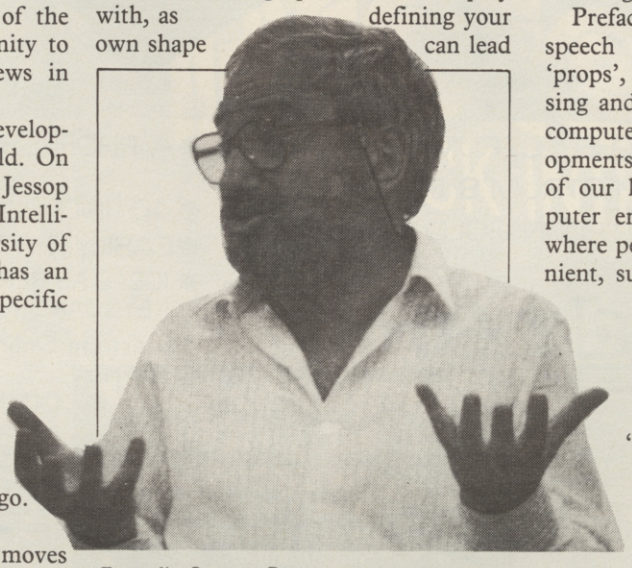
There are some exciting developments afoot in the hardware field. On show was the radio controlled Jessop turtle, developed at the Artificial Intelligence Department at the University of Edinburgh. The Para version has an interface which will operate on specific computers; that means a version is available for the Spectrum.

The radio control module will fit into the user port enabling the turtle to be controlled through Spectrum Logo. There is no problem with cables getting in a twist as the turtle moves around, and that is an obvious advantage. The Jessop turtle, looking like a transparent dome full of chips, was dressed in a motley array of outfits to make it look like a turtle, with head, legs and arms sticking out, reminiscent of Auntie Dot's yearly offering for the school jumble sale.

The Valiant Turtle accomplishes the feat of remote control by infrared and has a plastic body and eyes which glow. That will also interface with the Spectrum and be controlled by Logo. Prices of both these products are, however, almost certainly beyond the pocket of home users as neither would leave any change out of £200.

Of more interest to the home user is Zero 2, a clever little robotic device which will plug into Spectrums fitted with an RS232C interface. That will operate directly with Spectrum Logo. The basic model has three stepper motors, two leds, a two tone horn and a line follower. It includes a pen kit for drawing via Logo commands either on the floor or table. A kit form can be bought for as little as £79.95 or built for £99.95. With an eye presumably on the Christmas market, there is a strong possibility of a package bundling Zero 2 with Sinclair Logo for about £120. One has to hope that the device will live up to its specification especially in terms of resolution, supposedly better than 1mm and 1 degree.

User defined graphics are fun to play with, as defining your own shape can lead to great possibilities when writing games programs. Nevertheless they can be rather tedious and time consuming, with the added disadvantage that the BIN statements have to be typed in very carefully. There then follows the problem of making them move. The results are not always fast enough in Basic and require machine code routines to make them work at the desired speed.



Evangelist Seymour Papert.

The Spectrum sprite board is the answer to all those dreams of fast on-screen action without the sweat. Fitting into the user port of the Spectrum the sprite board provides 32 independently programmable sprites which can move in any direction all at the same time. The sprites will be programmable either from Basic or Logo. By using the second option in particular, animation is within the reach of far more people than before.

Marketed by Logotron, the Spectrum sprite board will be available at a price of £129.95, but as with all new technology one would expect the price to fall as production gets into gear.

Sprites were one of the main topics covered by Seymour Papert in his presidential address to the conference. Papert is the guru of the Logo movement, because not only did he and his team develop the language, but his book *Mindstorms* is the Bible of Logo enthusiasts. He is also a very witty and amusing speaker.

Prefacing the main section of his speech with demonstrations of his 'props', a camera with automatic focussing and his impressive NEC portable computer, he explained how new developments in technology enter the fabric of our lives. Thus the portable computer enables him to write in places where pen and paper are most inconvenient, such as in taxis, but it also becomes 'his' in a way no desktop computer could.

Papert is a somewhat blunt speaker; anyone who makes statements such as "Newton's Laws of Motion are horrible" must strike a chord with all those who have to study them in their school career. Motion is everywhere in our lives yet the laws which cover it are not immediately accessible and are expressed with reference to a particle, an abstraction. With sprites it is possible to explore the world of movement, just as Logo and the microworld of turtle graphics enable users to explore geometry in a concrete way.

As an evangelist Papert is bound to have his critics, and some delegates could be heard muttering sceptical comments about his claims for Logo. Yuri Leon, from the Haifa Institute of Technology, pleaded for moderation in the claims made for Logo, otherwise the situation may backfire, and many people would be disappointed.

Jessop Electronics Ltd, Unit 5, 7, Long Street, London E2 8HN. Turtle Price £170 + VAT.
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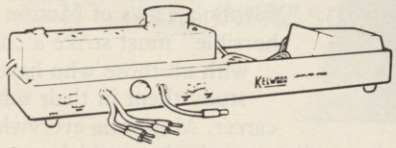

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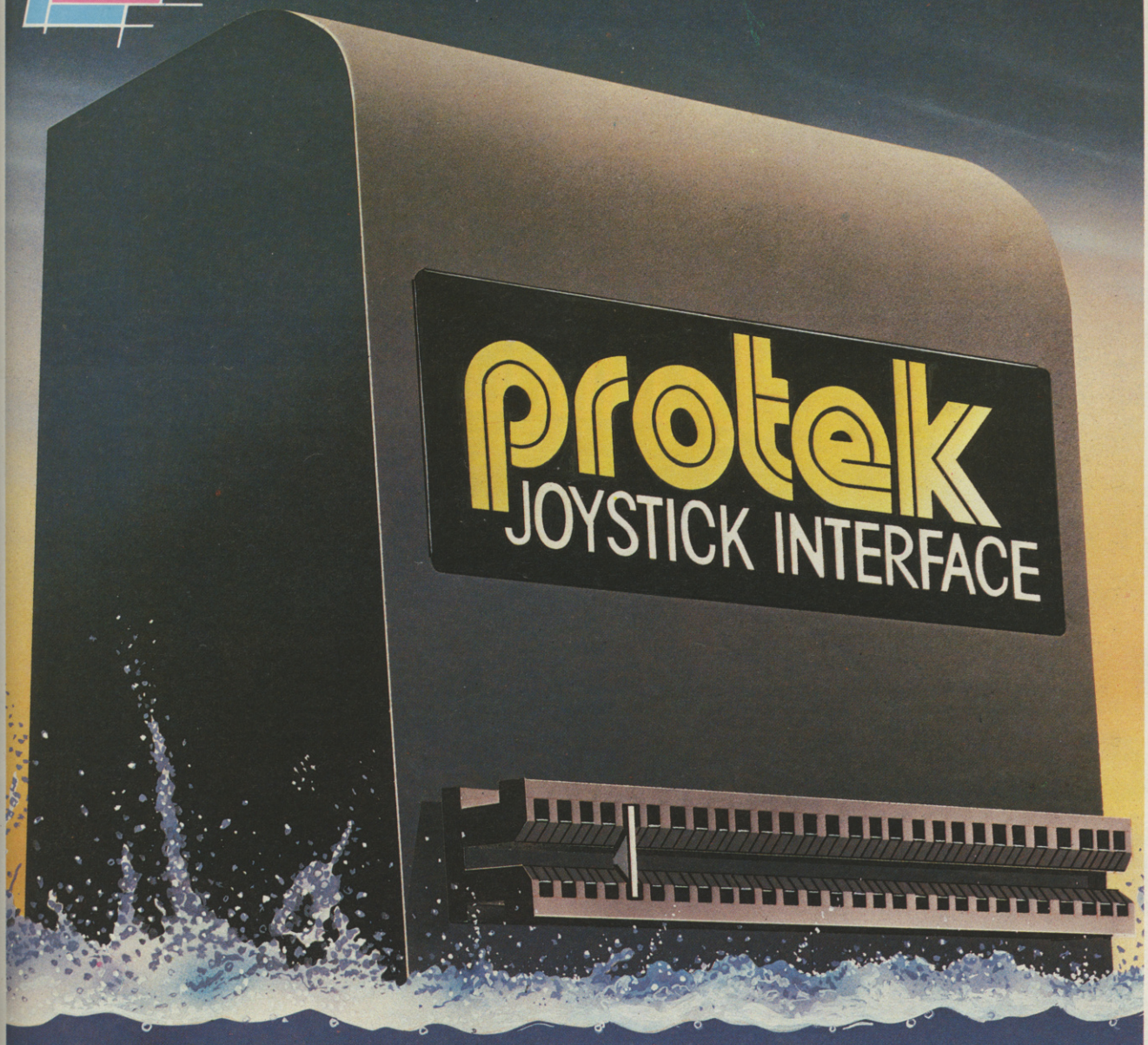

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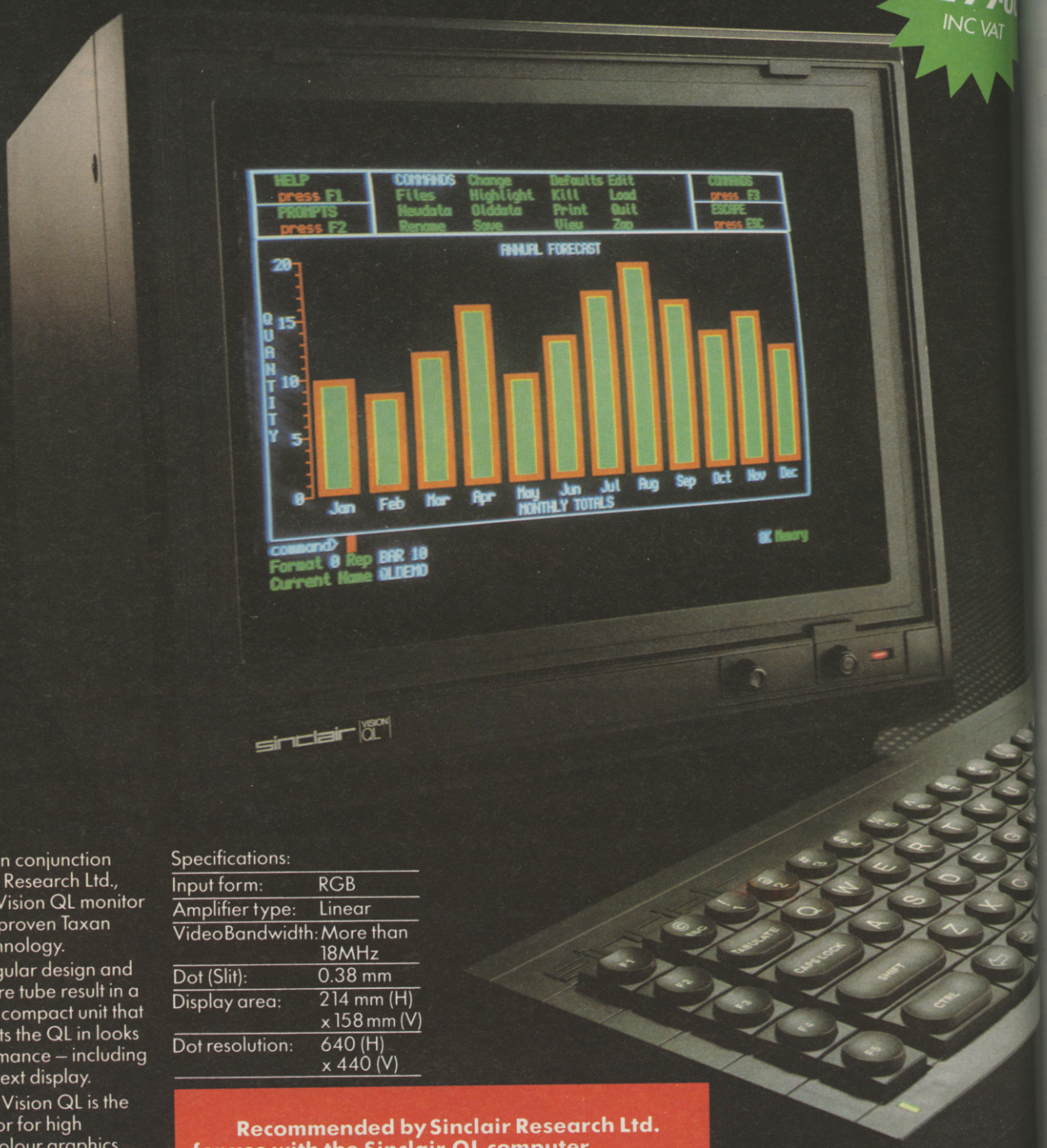

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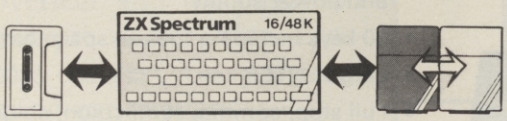

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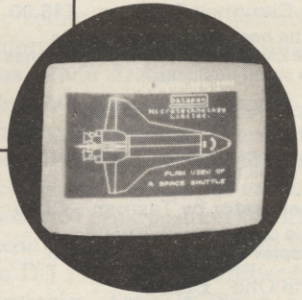

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This is one of the best database programs available for the ZX Spectrum. This program has many uses in a small business.

Dlan by Campbell Systems **£7.95**
Use your Spectrum to sell your products. Dlan will display messages in up to 11 different typefaces. Will scroll text in any direction.

64 Column Generator by Tasman **£5.50**
You can use this program within your other programs to display 64 columns on screen.

Payroll by Byte One **£19.95**
This payroll program will handle up to 40 employees and will calculate NIC, PAYE, superannuation and many other deductions. This is a very user friendly program and extremely good value.

NEW

Sales/Purchase Ledger Invoicing £25.00
This program is for use on micro-drive only. The program will print an invoice using a built-in price list and post the invoice to your customer's account. Will also print price lists, statements, labels etc.

Tasmerge £10.95
Allows you to transfer data from Masterfile into Tasword enabling you to use Tasword for mail merge. The program allows you to specify line and column of each field. For use on micro-drive only.

Superfile £14.95
This is a new database program that stores pages of text 64 columns x 22 rows. The program includes word processing and full search facilities.

Omnicalc 2 £14.95
This is the long-awaited micro-drive version of omnicalc complete with histograms and many other features.

Projector 1 £13.90
Business graphics program that will help you present your cashflow, sales expenditure in many different ways including pie line, and histogram charts.

Tasprint £9.90
Use this program with Tasword Two to produce 5 different fonts on a dot matrix printer.

MF-Print £6.95
Enables you to set a print format for your full-size printer within masterfile. Supplied complete with masterfile for **£19.95**.

Trans Express £9.95
Micro-drive utility program which will enable you to backup all your micro-drive cartridges.

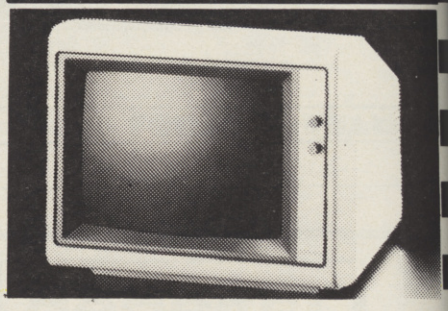
Now in stock

Blank micro-drive cartridges	£4.95
Continuous paper	£12.99
Printer ribbons from	£3.50

QL

Transform can supply a wide range of printers monitors, and leads for the QL. For further details send S.A.E.

Monitors



It is possible to connect your Spectrum to both Black/Green and composite Video monitors using high resolution monitors are particularly useful with programs like Tasword that use 64 columns. We supply complete instructions on how to connect monitors to both Issue Two and Issue Three Spectrums. These monitors can also be connected to your QL.

Phillips black and green	£75.00
Kaga/Taxan black and green	£99.95
Sanyo Med res for QL	£273.60

Printers

All the software we supply runs on full-size printers (unless you are using interface 1) you will require an interface to connect your Spectrum to a printer, the interface we supply uses the graphics characters to set printer codes as in Tasword and prints a double size screen dump.

Centronics/RS232 Interface	£45.00
Dot matrix printers	
Brother HR5	£132.00
Admate	£199.00
Star Gemini 10x	£209.00
Epson RX80 FT	£250.00
Epson FX80	£350.00
Daisywheel printers	
Smith-Corona TP I	£189.00
Silver Reed EXP500	£284.00
Brother HR15	£349.44

Please add **£5.00** delivery plus VAT to the price of printers and monitors. All software prices include VAT, post and packing.

Access

TRANSFORM LTD. (Dept. SU) 01-658-6350
41, Keats House, Porchester Mead, Beckenham, Kent.

BARCLAYCARD VISA

Contents

Mike Wright reviews the latest microdrive software overleaf and on page 163 antique dealer Alan Proctors shares his programming experiences.

SINCLAIR BUSINESS USER

November 1984

A long four years

THANK YOU for finding the time and space to review my **Building Price** program in the September issue.

I am pleased to see at last a start made with your *Sinclair Business User* to fill the need created by the ZX-81, Spectrum, and QL. It has been a long four years, for the few who took the plunge with the first ZX-81, waiting for the rest of the small businessmen and women to realize the benefit of the Sinclair computer and its future in the small business. In fact, the smaller the business the more the computer can help, as very often, especially in the building industry, the proprietor has to work on site and do the office work as well. I wonder how many fathers who have given their children a computer, try to do their office work in the evening, to the strains of **Jet Set Willy's** *If I was a rich man.*

The Building Price program has been in regular use for the last year and copes with most plans; I have just put through a plan for a small extension in less than 10 minutes. I have a microdrive which is a joy to use — it took me two years to write the program and it can load in nine seconds.

Long may you continue to support us Sinclair Business Users with your excellent magazine.

John Redman,
Axbridge, Somerset.

Record software

I SHOULD be interested to hear from anyone who is using one or more of the business programs on the market for the 48K Spectrum for running a small retail music tape/record business.

Postage and incidental expenses would be reimbursed.

E Robinson,
Record & Tape Centre,
6 Main Street,
Cockermouth,
Cumbria.

Printing space

IN DUE COURSE I would like to set the copy for a monthly newsletter using a micro-computer and a proportional daisy wheel printer.

Presumably, to do that I would need a word processing package that will show the effect of proportional spacing on the display screen — especially if columns are to be correctly justified. Is it possible to work in that way on the Spectrum or the QL, or indeed on any other popular micro?

Charles Lane,
London W1N

● *Proportional spacing is possible on most word processors. For the Spectrum* **Tasword 2** *is the best and the QL is supplied with* **Quill.** *That is all you will need as the software produces the format of a document and not the printer.*

Shop window

IN AN EARLIER issue of *Sinclair Business User* we asked for details of specialist programs of limited commercial value written by readers which might be of interest to other serious users. Details of programs will appear once only within *Sinclair Business User.* If readers would like details of their programs to appear regularly they can advertise in Sinclair Supermart at the back of the magazine.

Blackboard. Stores and solves equations without requiring any programming. It can contain 255 equations of up to 10 variables each. From VJB Software, 33 Merton Street, Bury, Greater Manchester BL8 1AW. Price £3.00 including p & p.

Building Price. Calculates the cost of constructing buildings and extensions, drawing a plan of the building after measurements have been entered. Contains more than 100K on two cassettes, price £15.00. Available from J Redman, Stevelon House, Slade Lane, Tarnock, Axbridge, Somerset BS26 2SH. Tel. Edingworth 518.

Calendar. Converts dates from Gregorian (European) to the Hegira (Islamic) calendar systems. Runs on 48K Spectrum, microdrive compatible, drives full-size or ZX printer. For further information contact E J F Austin, BAC Ltd, PO Box 2, Tabuk, Saudi Arabia.

D J Words. Versatile word processing program for 48K Spectrum with microdrive. Capable of 137 character per line in condensed mode. Enlarged, condensed, underlined, emphasized and italics modes available, as are tabulation, centralised and right justified print position and left margin changes. Fast text editing facilities. Priced at £13.80 including p & p, from D J Programs, Lawnspeedie, North Duffield, Selby, N Yorkshire. Tel (075 785) 615. A range of computer programs for farmers also available.

School Fund, Class List. A rang of administrative programs for teachers, as well as educational and business software. For further information contact P Nethercot, 2 Chantry Close, Sunderland SR3 2SL.

Mike Wright reviews two products which explore the business potential of the Spectrum

Microdrive pioneers

MORE AND MORE business programs are, at last, advertising microdrive compatibility as a feature. Transform and Hestacrest are both companies which have released programs which go further and require not one but two microdrives.

Invoicing/Accounting from Transform is designed for a 48K Spectrum fitted with twin microdrives and an 80 column printer. It costs £25.00 — or £15.00 for owners of the present Invoicing program — and it bravely attempts to provide all the features of large business systems.

Somewhat strangely, it seems at first, the suite is supplied in a large plastic book type case containing two cassette tapes. The programs must be loaded from tape, customised for the user's interface and saved to microdrive. The infamous problems encountered with microdrive cartridge compatibility, where programs saved on one microdrive will not always run on another, have been a factor in Transform choosing to release the programs on cassettes, one for the ledger and one for the invoicing program, rather than on microdrive cartridges. On one side is a version for a Tasman interface. A version for other interfaces is on the other side.

The customised ledger and invoicing programs are saved onto different cartridges with a third being used for the shared data. When back-up copies of programs and data are made six cartridges are needed.

One feature is the inclusion of **Taswide** to give a 64 column screen display. Once copies of the programs have been made the data can be set up. The Accounts cartridge is placed in drive one and the data cartridge in drive two.

You select option D at first from the main menu to set the date which is printed on statements. That can be entered in any format required. Option U is used to enter details of the accounts on the first run and to add new accounts in later runs. A flashing cursor is used to guide the user in setting up the account. The first input is an account name of up to 10 characters, although referred to as an account number. Next the name and address are entered and finally details of debits and credits — marked with a minus sign.

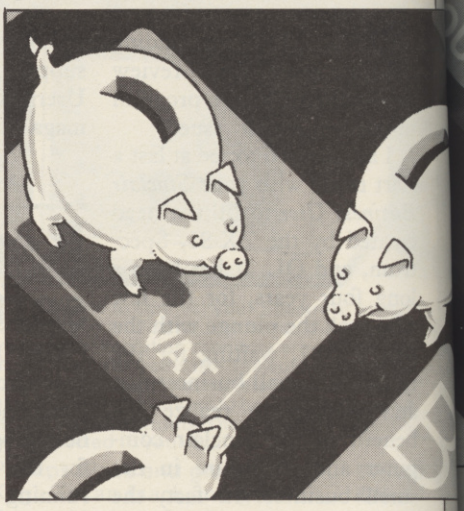
Once the details have been entered they are saved on drive two. When the data has been saved the option of making a back-up copy by replacing the data cartridge with another is given before returning to the main menu. The original data cartridge can then be replaced and a second account set up. Although it is safer to make the back-up copy at each stage you might find it more convenient when setting up accounts to enter the next account, then make a back-up copy of the whole cartridge once all accounts have been entered.

An account is updated by first loading it into memory using the save and load option then the load account option G of the save menu followed by Y to confirm the choice, before entering the account name.

Once an account has been loaded the screen shows the account reference, the name and address and a delivery name and address together with the last ten items on the account. An abbreviated menu is displayed at the bottom of the screen. Two lines of text can be printed on statements. Other options allow address labels to be added, the delivery address or statement cleared. Statements, address labels, delivery labels and remittance notes can be printed.

The invoicing program is used to set up and print invoices. The details from the invoice can be added to the accounts data at the push of a button and it is that feature which makes the programs an excellent buy for the business user. The invoicing program is loaded from the accounts program by replacing the accounts cartridge with the invoice cartridge and selecting option Q in the save menu. The invoicing program will usually be run first and the data transferred to the accounts program. Once loaded the main menu is displayed, offering you options, among others, to change the VAT rate, add items to the price list and print that price list.

Your name and address, up to seven lines of 64 characters, and a price list of up to 200 items can be used in the



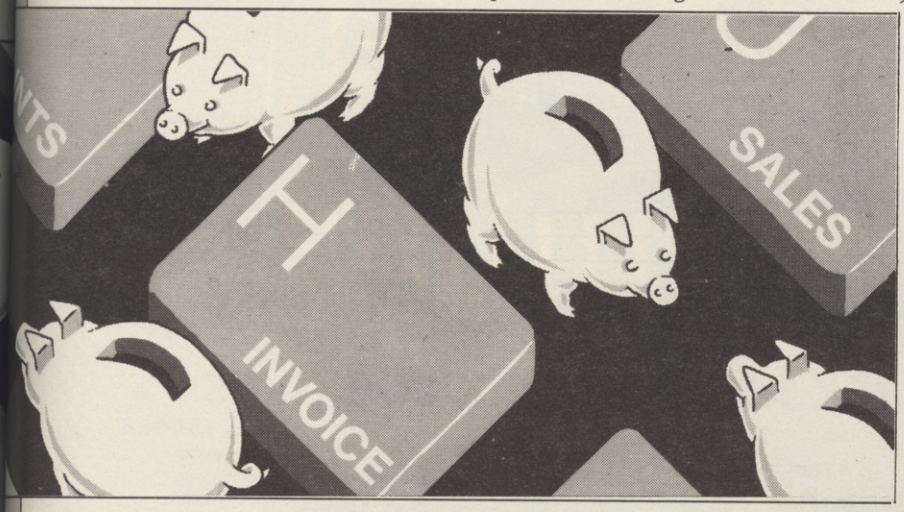
program. Each item is given a description and a VAT exclusive price. VAT at 15 per cent is calculated, added onto the price, and displayed.

An abbreviated menu is displayed at the bottom of the invoice. A flashing cursor prompts for entries to be made. The account reference is first. If an account has already been set up then the addresses are added automatically. The date, invoice number and a reference are entered next. Then the items are added, the quantity being entered first. Details and unit price are added either by typing or by entering the price list number. The cost is calculated and displayed. Entering 't' as a quantity calculates the total cost of the items. Details of postage, any discount, settlement discount and the VAT rate are added. Only one VAT rate can be used per invoice which could be a problem if your business deals in goods or services

which have different rates.

Finally, up to two lines of text can be printed at the bottom of the invoice. Those lines must be added, even as blanks, before the invoice is printed correctly with the discounts and VAT shown. Other options allow credit notes, orders or addresses to be typed, changes made to the invoice and there is even an option to clear all or parts of it. The invoice, address label and delivery label can all be printed from the invoice menu. The invoice details are added to the accounts data through option X. A warning is given if the data has not been added to the accounts.

Throughout the system the layout of the display and printouts is extremely clear and well-designed. That helps make the programs effective in speeding up the production of invoices and the accompanying accounts. Despite that, however, the programs have some disadvantages.



The first drawback is the number of microdrive cartridges needed if back-up copies — a necessity for business users — are to be made. It would be nice to see both programs on one cartridge. For some applications the lack of a sales analysis could also prove annoying. An update has been released that allows the sum of all accounts to be produced.

Sales Ledger for the 48K Spectrum, from Hestacrest Business Software, forms part of an accounting package which also includes a cash book and nominal ledger, each priced at £32.50 or £72.00 for all three. In contrast with the Transform software, Sales Ledger is supplied on microdrive cartridge.

The program supports full size printers with Centronics or RS232 interfaces as well as producing abbreviated printouts on a ZX printer. With a Centronics interface the driver software must first be loaded before the program is run from drive one; a data cartridge is placed in drive 2.

On the first run the program is set up by prompting for your name and address, your security password, up to six different VAT rates and the type of interface to be used. Giving cash discounts and linking to the other programs are also catered for. On subsequent runs only your password is asked for and whether you are starting a new accounting period; if you are then the details of the last period's transactions are cleared from the data cartridge.

You can handle up to 50 sales analysis codes of 10 characters and 250 customers. Transactions are defined in four categories — invoices, credit notes, journals and cash (including discounts) — and are all entered from a subsidiary menu. Each time you select a transaction menu option in an accounting period the data is given a batch number; up to 40 batches and 1,000 transactions can be dealt with in any one period. Individual transactions of up to £100,000 and a total of £1 million can be handled.

When entering invoices and credit notes you are prompted for the customer's code number, a reference number, the analysis code, the amount excluding VAT and confirmation of the VAT amount. VAT is calculated from the first digit of the reference code which corresponds to a VAT code. A REF LOCK option, which repeats the customer code and reference number leaving you to enter the analysis code and amount, helps reduce typing.

Opening balances are entered using the input journal option of the transaction menu. That prompts you for the account code and amount. Cash transactions can be input either from the keyboard or by links to the cash book.

At the end of an accounting period an option allows you to print the daybook, cash listing, journal listing, account statements, lists of debtors and customer address labels. Printing the daybook on an 80-column printer, will give you the customer name, account number, reference, item code, net and total amounts and the item description. On a ZX printer only the account number, item code, net and VAT amounts can be obtained.

The statements and debtors option of the period end menu allows statements to be displayed or printed, and a list of debtors with debts can be printed also. Your own or the customer's version of statements, headed with your name and address, can be printed too, showing the type of transaction, a reference, debit or credit and opening and closing balances.

You must use the end of run option before removing the cartridges from the microdrives. That updates the sales data cartridge and once it has been updated the program must be replaced in drive one with a third cartridge. That is formatted before an updated copy of the data, is made.

The program is very user-friendly after you overcome your initial irritation at loading the interface software every time and using the full load command instead of a run file. The ability to fix VAT rates individually is very useful as are the sales and VAT analyses. The printouts are clear enough although you might find them clumsy.

Both the Transform and the Hestacrest programs can be seen as another step forward in the drive to show that the Spectrum can be used very effectively in business, and although both have weaknesses whether or not those matter will depend on your requirements. They are the first programs to use microdrives as if they were disks. Other companies must surely follow when they see what can be achieved.

Transform Ltd 41 Keats House, Porchester Mead, Beckenham, Kent. Tel: 01-658 1661.

Hestacrest Business Software PO Box 19, Leighton Buzzard, Beds. LU7 0DG. Tel: 052-523 7785.

INVOICING/ACCOUNTING
Memory: **48K**
Price: **£25.00**
Gilbert Factor: **8**

SALES LEDGER
Memory: **48K**
Price: **£32.00**
Gilbert Factor: **8**

Cashflow problems? Kuma attempts to find the answer

Domestic finances

HOME BUDGET from Kuma Computers is intended to help you plan your finances. The program is cassette based and has no manual or written instructions. Instead, a series of Help pages are included in the program.

You keep track of your finances by defining a 'year' and entering income and expenditure for each month. The amount entered can be a forecast to be updated later. Expenditure can be entered as one of 10 user-redefinable categories. On the first run the program eases the entry for each month by prompts. Entries can be changed using the back-up option which permits you to re-enter a previous entry.

Option 1 on the main menu allows you to add data or create a new file. It also has a special rolling budget feature which allows new files to be created using the existing data.

Entries for a particular month are displayed using option 2, which also shows the following month's data. The results for any category can be displayed as a three-dimensional bar chart. Those allow you to define the vertical scale and they do look impressive. The effect, however, is lost when a chart is printed. A printout can be obtained from any of the display options by pressing P.

When the file is saved a six figure security code appears which must be re-entered when the data is loaded.

Though Home Budget is easy to use it cannot be described as user-friendly. The Help pages, which are a great idea, are not effective and the overall lack of instructions is disappointing. That is characterised by the back-up option, which does not make a spare copy but moves back one entry, which is not explained.

You will probably find the biggest obstacle to using the program lies in the fact that monthly totals of expenditure have to be entered. Since such information is not usually kept in that form a separate program such as **Finance Manager** may be needed to get category totals first.

Kuma Computers Ltd Unit 12, Horseshoe Park, Horseshoe Road, Pangbourne, Berks. RG8 7JW. Tel: 07357 4335.

HOME BUDGET
Memory: **48K**
Price: **£5.95**
Gilbert Factor: **5**

INTEGRATED BUSINESS SYSTEM FOR SPECTRUM 48K AND TWIN MICRODRIVES

PURCHASE LEDGER
Produces:
Supplier Accounts
VAT Analysis
Purchase Day Book
Journal Listing
Creditors Listing
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Cash Listing
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250 supplier accounts
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★ Professionally designed for twin microdrives
★ Integrated or independent system
★ Easy to operate with clear screen instructions
★ Machine code routines for fast processing

HESTACREST BUSINESS SOFTWARE

SALES LEDGER
Produces:
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Day Book
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250 customer accounts
£32.50

CASH BOOK
Produces:
Cash and Bank Summary
Cash and Bank Receipts Listings
Cash and Bank Payments Listings
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250 supplier accounts
250 customer accounts
£32.50

★ Full audit trail and batch controls
★ 64 characters per line screen display
★ Full size printouts for 80 character printers (RS232 or Centronics)
★ Abbreviated printouts for ZX printers

NOMINAL LEDGER AND ACCOUNTS
Available shortly

SPECIAL PRICE
Any two programs **£52.50**
Any three programs **£72.00**

All programs are supplied on microdrive cartridge with full operating instructions
Full details

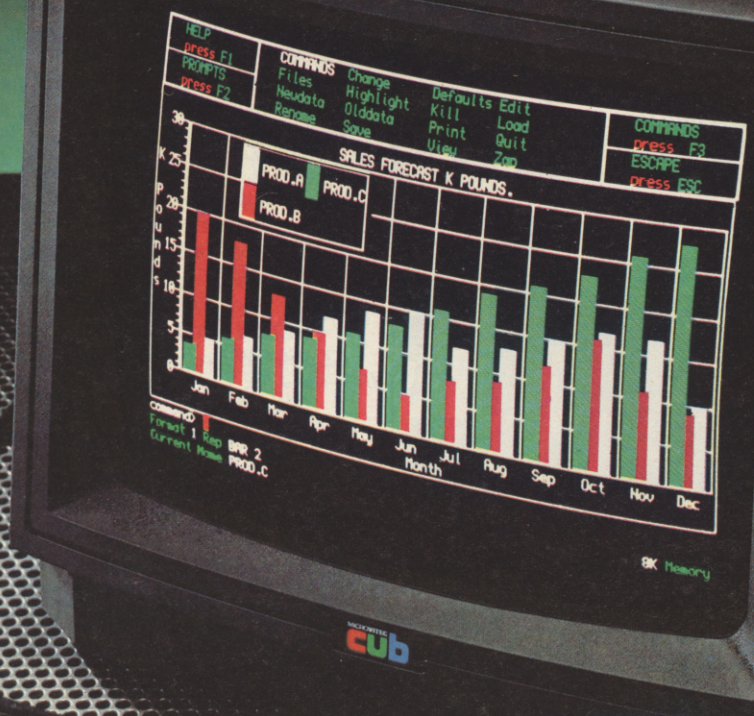
HESTACREST LIMITED
PO Box 19, Leighton Buzzard, Beds LU7 0DG. Telephone: 052523 7785

NEW PRODUCT ANNOUNCEMENT

EVEN THE PRICE WILL KEEP YOU IN THE BLACK

This sleek, black Microvitec CUB medium resolution colour monitor has been designed to be totally compatible with the Sinclair Q.L. An ability to display 85 column text is combined with outstanding graphic capabilities – at a price that won't break the bank.

£275
(inc. VAT)



Specification

Model:
CUB 1451/DQ3
14" Q.L. Monitor
RGB TTL input
Tube Resolution (pixels)
653(H) x 585(V)
Dot Pitch 0.43mm
Bandwidth 18 MHz

Also available in Standard Resolution version for only £225 inc. VAT.

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COLOUR DISPLAYS

Microvitec PLC, Futures Way, Bolling Road, Bradford BD4 7TU, West Yorkshire. Tel: (0274) 390011. Telex: 517717

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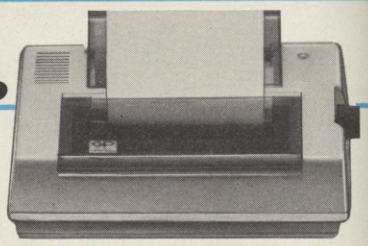

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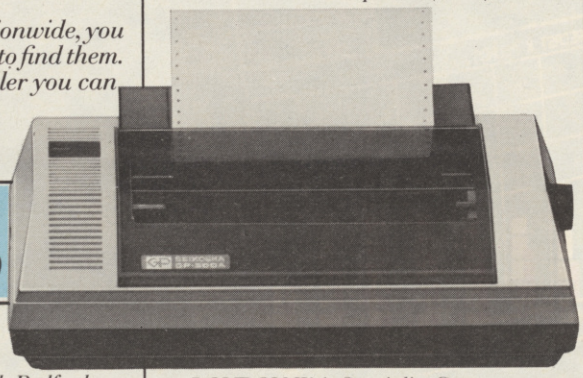
SEIKOSHA GP500A
Takes pin-fed paper up to 10" wide. 50 cps print speed. **£175.00**



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***HERTFORDSHIRE** Watford: Computer Plus. (0923) 33927.*

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***LONDON** W.1: Specialist Computer Centre Ltd. 01-935 4150. Eltham: The Advanced Technology Centre. 01-859 7696.*

***LINCOLNSHIRE** Grantham: Oakleaf Computers. (0476) 76994.*

***MANCHESTER** Sumlock Electronics Services Ltd. 061-834 4233.*

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***SUSSEX** Worthing: Worthing Computer Centre. (0903) 210861.*

***TYNE AND WEAR** Gateshead: H.C.C.S. Associates Ltd. (0632) 821924.*

***WEST MIDLANDS** Birmingham: Specialist Computer Centre Ltd. 021-643 4743. Coventry: Coventry Micros. (0203) 58942.*

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***GLASGOW** Exchange Computers Ltd. 041-424 4242*

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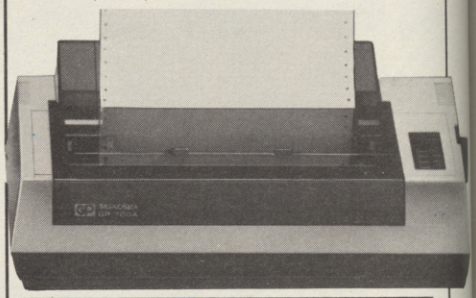
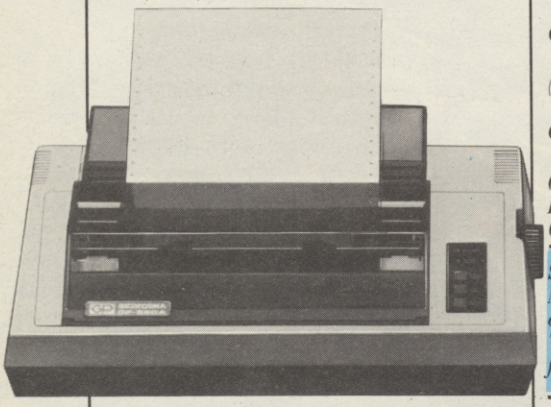
***CLWYD** Abergele: Abergele Computer Centre. (0745) 826234.*



SEIKOSHA GP700A
Gives excellent colour printout in 7 colours and 30 shades in one pass, on pin or friction-fed paper up to 10" wide. Prints text at up to 50 cps. **£349.95**



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Please send me more information and an order form for:
GP50A ☐ 50S ☐ 500A ☐ 550A ☐ 700A ☐

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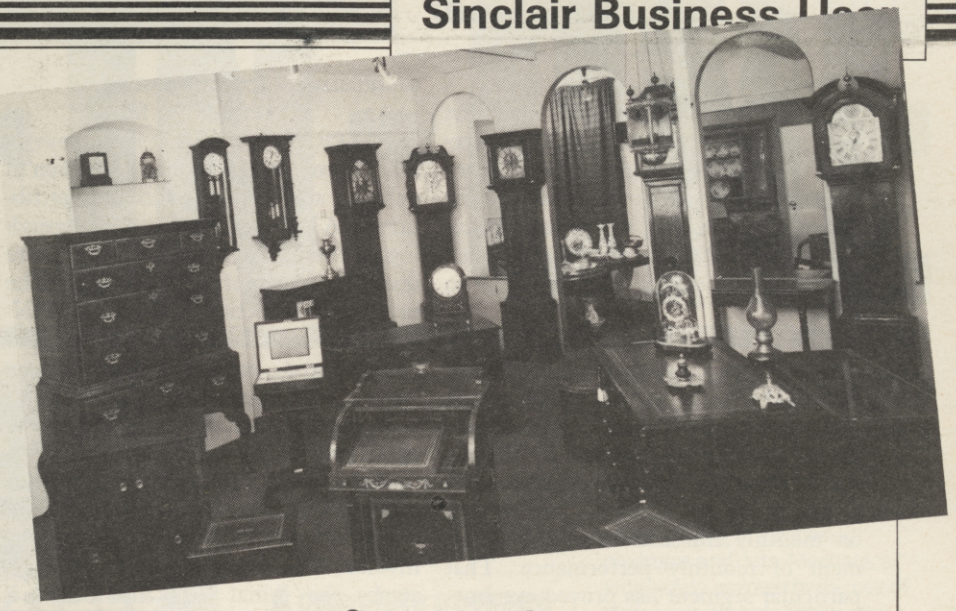
DRG Business Systems, Dealer Division, 13/14 Lynx Crescent, Winterstoke Rd, Weston-Super-Mare BS24 9DN. Tel: 0934 416392. Telex: 444761.



ZX-81 in the antique shop

Alan Proctor outlines the problems

MY WIFE, SON AND I are employed in the buying, restoration and selling of antique furniture and clocks. As I am a retired civil engineer and my wife takes care of the sharp end of the business I am left to attend to such mundane things as shipping, administration and accounts.

Our business has a turnover which has peaked to around £250,000 per year but is usually around £200,000. We are a limited liability company so the requirements for the maintenance of accounting records and the production of final accounts at the end of a financial year are more stringent than for an unincorporated business such as a partnership or sole proprietor.

Antique dealers, in common with some other traders such as second hand car dealers, may be involved in Special Scheme VAT. The VAT due to the Customs and Excise is calculated on the margin between cost and selling price, not on selling price alone as is the case with the standard VAT scheme, operated by most other business concerns. That introduces a complication for financial accounts whereby purchase cost of individual stock items has to be held until a sale is made.

The cost of employing a bookkeeper — additional to audit fees which we cannot avoid — and a natural aversion to the grind of traditional double entry bookkeeping gave me the final excuse to persuade my wife we should invest in a computer. She agreed to a ZX-81!

That was two years ago. The system now comprises a Memotech 64K memory and parallel interface, a Dean Electronics keyboard, a Seikosha GP100A printer and a rapid load/save Eprom based on Q Save but faster. Without that ROM-based utility, which allows loading or saving the full 64K of memory in 1½ minutes, I do not think the ZX-81 can be seriously considered for general commercial application.

In describing the specification for my system I have to admit that it is a result of evolution during development rather than a system analysis followed by program production. With hindsight I have to admit that I rushed into program coding too early, due the urge to play with the computer. I should have spent more time on detailed system specification in the first instance.

Another lesson learned the hard way was the importance of flowcharting. That technique proved essential both in an overview of the general objectives and subsequently the detailed logic sequences prior to coding. Undoubtedly had I been a trained systems analyst/programmer I would not have made those mistakes — but then neither would I be an antique dealer.

The system now consists of four program segments and two datafiles. All financial transactions are input into ACCTDATA data file by means of ACCTPROG. The principal data array records hold data in a number of categories which describe stock purchases or sales, administrative cost, capital accounts and cash receipts. The system accommodates both direct and credit transaction.

Each record contains the keys necessary to post to all relevant accounts from each transaction. For instance, the single record for purchase of goods on an individual purchase invoice with post, or printout, to purchase ledger, one entry; personal account of supplier, two entries if cash paid; and Bank, for cash account if payment is made at time of purchase. A provision for 1700 financial records has proved more than sufficient for the last financial year. Facilities are also included to deal with opening accounts, standing orders, monthly or annual, and if monthly, full or partial year payments. ACCTDATA contains all the information needed to produce, when needed, details of individual ledger accounts with full or partial listings, or just monthly balances, individual or administrative. Also End of Year final accounts, trial balance and balance sheet.

Whilst the financial accounts do not require details of purchase and sale of individual stock items per se, those details are required to be kept in a specific form by Customs and Excise if the Special VAT scheme is being operated. Also the auditors require full information on all transactions in order to be able to do an audit trace on any constituent part of the accounts.

The additional details are maintained in SALEDATA. Each record in SALEDATA is based on an individual stock reference number. It contains a description of the item, date, details of purchase and sale, client and supplier, sales invoice number, VAT details and cost and sales prices. SALEDATA contains 750 records which have proved more than enough for one financial year.

When data has been input the file on line is ACCTDATA. Those aspects of data required for SALEDATA are transferred on input to low memory (12K — 16K) so that when the new generation of ACCTDATA is saved and the previous generation of SALEDATA is loaded, the data required is not lost.

On loading SALEDATA an instruction is given to STOP the recorder when the old generation is loaded. The data is then transferred into the SALEDATA records from low memory automatically. A further instruction is given

continued on page 164

continued from page 163

to restart the recorder on SAVE and the new generation of SALEDATA is created. That facility of using low memory is extremely useful for data transfer or program operating variables loading when the continued memory required of program and data files are close to 64K.

The SALEPROG segment of the system provides a means of interrogating SALEDATA for given current stock lists, current stock value, details of individual stock items, analysis by invoice number, customer, dealer or item, such as clocks, tables and so on, and reports on monthly transactions with a statement of monthly performance. That particular segment has proved extremely useful to me as a management tool.

The ACCTPRNTPROG segment provides the financial reports from the ACCTDATA records. Those include cash flow and bank balance reports and can also provide analysis of types of expenditure per ledger account. How often has the reader been requested by the tax inspector to provide an analysis of sundry expenses? That single byte in the record provides the facility to produce a full subsidiary analysis, often used by bookkeepers as the preliminary to impersonal account posting.

An interesting feature of ACCTPRNPROG is that it employs an array to control the action to be taken in debiting and crediting accounts, attributing VAT to input or output, depending on the nature of the record. Due to insufficient memory, the array has to be saved in conjunction with ACCTPRNPROG after all other variables have been cleared, using the low memory transfer technique.

A further segment has been developed called INVCPROG. That produces a full invoice with file, invoice number, customer details and full item description. If for export, a shipping invoice is also produced. In that instance the initial data file loaded is SALEDATA. The autoload from low memory subsequently being to ACCTDATA. Although almost complete, my wife and son consider a computer produced invoice is hardly in keeping with the image of an antique shop.

Developments in the world of computers are so fast that whilst my decision two years ago to go ahead with my own system was valid then, I am not sure whether it is so today. Whilst there are a number of financial packages available I do not know of any that cater for Special Scheme VAT. I now have a working package of interactive programs using common data files which is based on output information I want, and an input format to suit me and my business.

I once, somewhat rudely, described the so-called computer specialist as a person who designs a very clever, computer-orientated solution and then seeks out someone whose problem could be made to fit it.

There are many problems for anyone introducing a computer into a small business. If I had made the decisions in our business, we might have had about 50 per cent of the programs completed, but probably no business life to apply them to.

I feel that for most amateurs, serious programming requires an application that borders on obsession. This can produce several strains into the domestic scene. On the other hand, the employment of a professional agent in producing custom-made software would probably result in a cost for software and hardware that the owner of a small business might find hard to justify.

For further information about accountancy programs contact Alan Proctor, Windsor Antiques & Design, 80 High Street, Eton, Windsor, Berks SL4 6AF.

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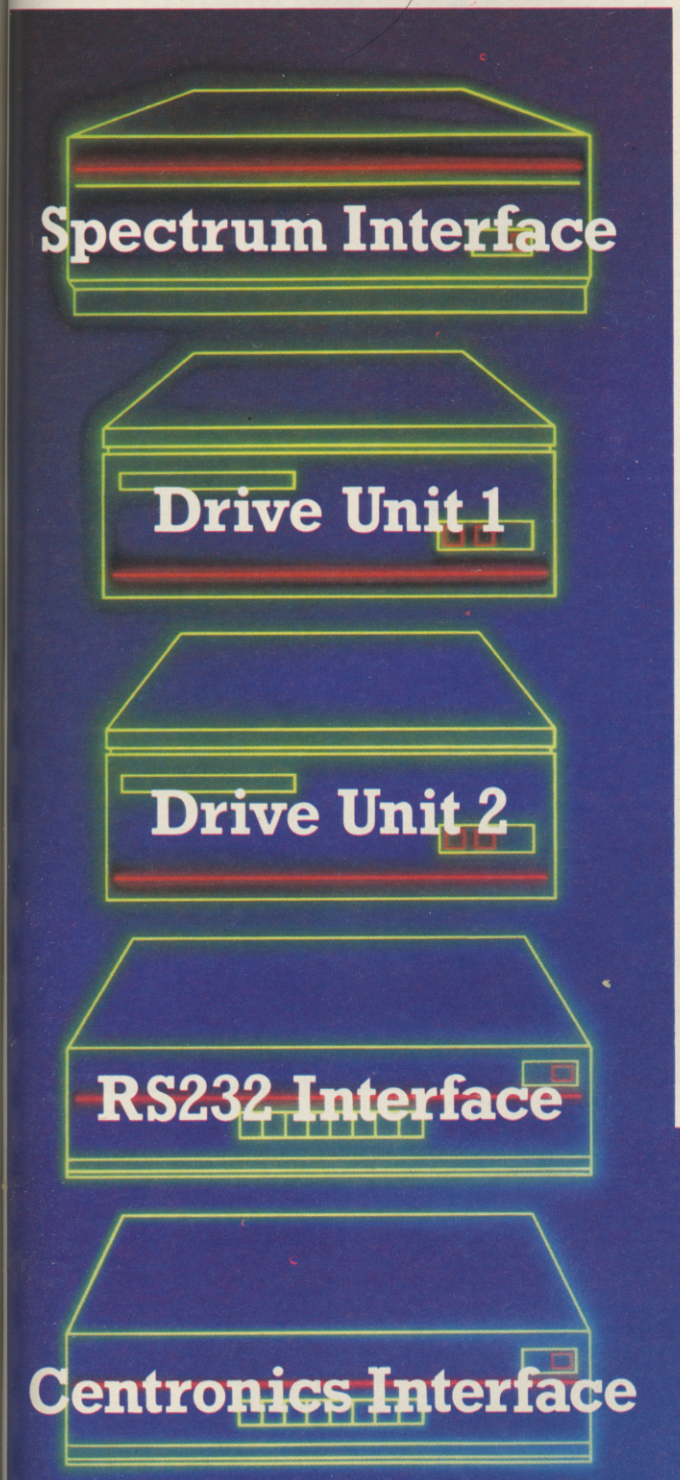

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Gemini for the 48K Spectrum

Bumper Packs

Business Bumper Pack

C.0415 £24.95

The best in the business! Written by businessmen for businessmen, Gemini's board of Directors contains three Chartered Accountants, and their accounting software brilliantly maximises the potential of the 48K Spectrum for commercial use.

Containing a professional standard manual, the Bumper Pack is in fact a COMPLETE CASH BOOK ACCOUNTING SYSTEM replacing ALL manual records, and is ideal for the cash based business. You can transfer all receipts and expenditure records to the computer, together with Bank Account, Petty Cash records, and all VAT transactions. The system also supports 90 nominal accounts! Summaries are then prepared by the 48K, listing all the information which would normally take hours of tedious manual bookeeping... in a fraction of the time. Gemini's Cash Book Acounting System is even used by Chartered Acountants for incomplete records.

Having prepared these summaries, and a Trial Balance, the software then allows you to add details of year end adjustments, such as Depreciation, Bad Debts, Creditors and Debtors, and prepares a full Balance Sheet and Profit & Loss Account. It even produces COMPARATIVE figures, such as budgets or previous years' results, alongside the current year's figures, together with notes to the accounts.

Written to the same specification as Gemini's widely acclaimed Accounting Systems for the BBC Micro and the Commodore 64, this BUMPER PACK for the Spectrum 48K represents quite remarkable value for money, and could easily save its cost in the first week of use! Business decisions can be made more quickly and profitably, based upon accurate, up to the minute, computer data, and vital management information is available from your 48K at the touch of a key.

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Also available for the following machines:

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Cassette	**C.0818**	£89.95
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Home Software Bumper Pack

Contains the following programs, all cleverly and excitingly written to **STRETCH** the 48K to the limit... the ideal follow up to leisure software to truly exploit the Micro's potential for ALL the family (including Mother!).

C.0417 £24.95

Database: The Gemini Database Management System is a program designed to enable the user to store all types of information in similar format to a card indexing system. The program will ask you for the headings under which you wish to store the information on a 'card', i.e. for a record collection database these might be 'Artist', 'Song', 'Composer', etc., or for example in a database set up for a deep freezer, 'Use by date', 'Value', 'Type of food', 'Shelf', etc.

Having set up your fields, you may then add, delete or change information on the 'cards' under the headings you have elected. Gemini databases contain other important and useful utilities as well, e.g. alphabetical and numerical sorting, numeric calculations, finding records that meet specific requirements, line printer routines, browsing facilities, etc. For example a list of all recordings by a particular composer, calculate total value of freezer contents, etc.

Mailist: Gemini's Mailist program will enable you to keep a record of names and addresses and then print, examine, sort and find them, all with special selection techniques, containing our exclusive 'SEARCHKEY' system, giving you the option of creating your own dedicated coding system for each name on file. For example, on most mailing list systems, you are only given the standard heading such as name, street, town, country, postcode etc. With the Gemini searchkey system, you could find, say, all names on the file that are companies having a turnover in excess of '50,000' or all names that are subscribers who are behind in their subscriptions or all names that are eligible for a Christmas card this year!

A full and useful range of routines is included in the menu, and the program allows you to set up your own format for printing labels, i.e. the tab settings you require and spaces between labels, etc. Multiple copies can also be printed.

Graph Plot: Provides an easily assimilated visual representation of numerical data.

For example monthly sales statistics comparing two year's results may be instantly converted into two side by side pie charts, histograms or graphs... for easier visual comparison and assimilation.

It is particularly recommended where any kind of mathematical plotting facility is required.

"Independent Press Comments"

"Remarkable software, friendly and well designed, a pleasure to use."
— Gemini Cash Book, The Scotsman 12/8/83

"Will enable business people with a moderate grasp of accounting principles to produce a set of figures that will satisfy both the bank manager and the Tax man."
— Gemini Cash Book, Micro User, August 1983

Home Accounts: Designed as a complete Home Accounting package, this program allows the user to set up a budget for items of household expenditure and compare actual expenditure with budget. A running total of all surpluses and deficits is available both as digits, and in the form of a bar chart.

A complete Bank account routine is included, together with suggested expenditure categories such as mortgage, rent, rates, telephone, gas, electricity, etc. However, these may be deleted or augmented without difficulty.

Available from:

Larger branches of Boots and W.H.Smith and most good software dealers... or phone Gemini for prompt despatch quoting your Access, Visa, or American Express card num Telephone (0395) 265165. Alternatively make your cheque Postal Order payable to Gemini Marketing Ltd., amd send Gemini Marketing Ltd., 18a Littleham Road, Exmouth, De EX8 2QG.

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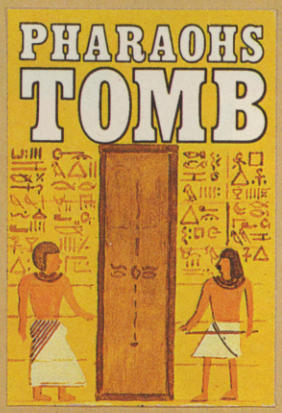
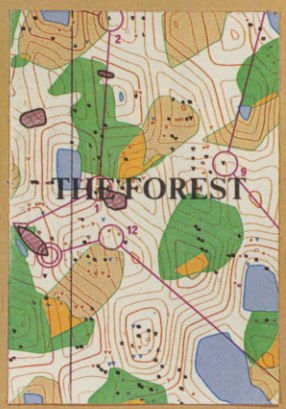


You discover the entrance to an ancient pyramid blocked by a rock. Once inside, you discover fire rooms, ice rooms and other traps set by the builders to protect the Pharaoh. **£4.95**

A rope above a rock fissure is the only way into this Magic Mountain, or is it? Legends tell of vast stores of treasure but also of poisonous spiders, lizards and magic at work. **£4.95**

An old deserted mining town holds the clues to the location of a lost gold mine. Once in the mine, your problems are not over – the roof creaks alarmingly and might cave in. **£4.95**

It is nearly dawn, you are poaching rabbits in a field of carrots. See how many you can bag undetected by the game keeper. Highly original arcade style game. **£4.95**



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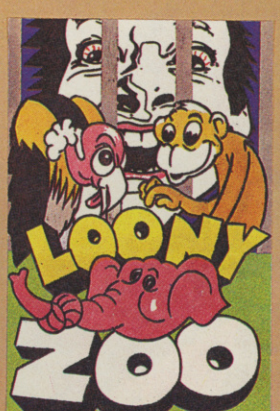
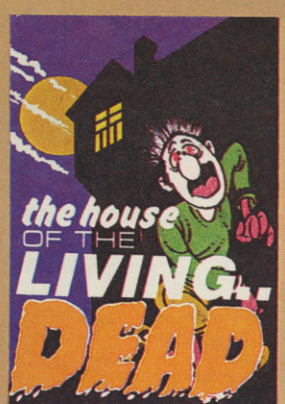


You have been captured and put into a Zoo. You can reach the gate release mechanism by jumping up and down the various ledges, if you can dodge the obstacles. **£5.95**



The night brings out vampire bats, skeletons and creeping hands. To lay them to rest you must assemble four pieces of the Cross in the centre of the house. **£5.95**

The Killer Knight has captured your companion. He stands on top of the castle throwing missiles in your path. You must dodge these objects as you attempt a rescue bid. **£5.95**

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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.

Bug — an error in a program.

EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.

Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.

Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.

Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.

Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.

Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.

Port — a link to the outside world which can be used by programs and the computer.

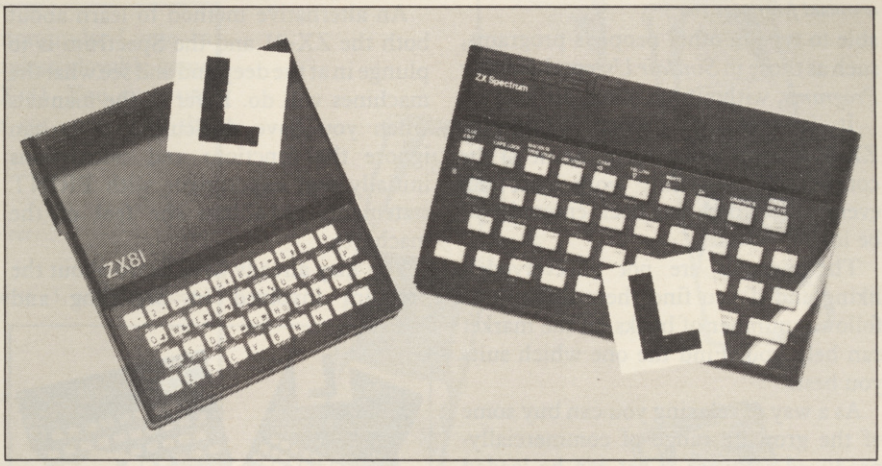
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.

RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.

ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.

Software — programs which control the operation of the computer.

Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the QL computer is big enough for use in small businesses, the Sinclair computers are not really suitable for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 170

continued from page 169

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

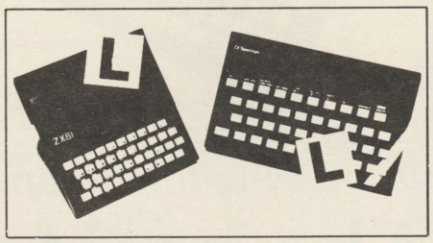
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

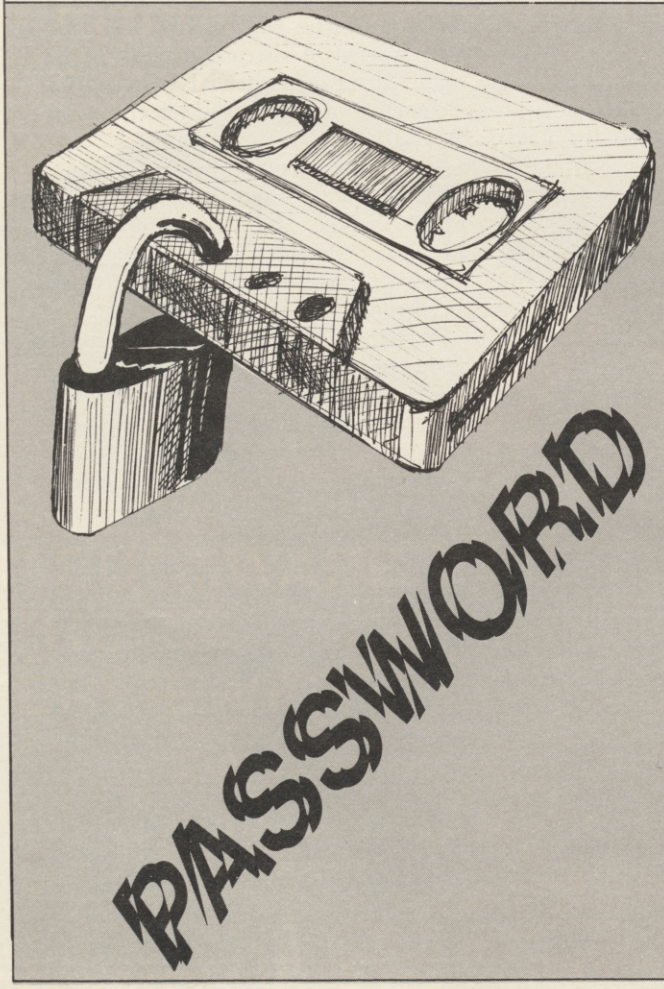
Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then rewind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.



PROTECT your programs from snooping eyes with this simple Basic routine by Hamish Barr of South Wirral. The program asks for a password, in this case 'eugene'. To use your own password simply alter the word 'eugene' in line 60, making sure you use six characters.

The program works by POKEing the number of lines at the bottom of the screen with the value 0. Since that is where error codes are printed, any attempt to BREAK the program will result in a systems crash until the correct password is entered, and the value is reset to 1.

The program can be used with any Spectrum, but please do not use it with programs that you want to send to us for publication!

```
  5 POKE 23659,0
 10 LET s$=""
 20 PRINT AT 12,9;"ENTER PASSWO
RD"
 30 PAUSE 0
 40 LET a$=INKEY$: IF a$="" THE
N  GO TO 40
 45 LET s$=s$+a$
 50 IF LEN s$<>6 THEN  GO TO 30
 60 IF s$<>"eugene" THEN  PRINT
 AT 1,5;"SORRY WRONG PASSWORD":
PAUSE 100: NEW
 70 PRINT AT 16,14;"O.K.": PAUS
E 100
 80 POKE 23659,1
 90 CLS
100 REM REST OF YOUR PROGRAM
```

DRIVER

DRIVER by D Gough of Ashton-under-Lyme in Manchester is probably the simplest playable game possible on the unexpanded ZX-81. You must use cursor keys 5 and 8 to control the car, avoiding the obstacles in your way.

Variable used:

A: Holds the horizontal position of the car.
S: Keeps the score.

Line 10 Sets the horizontal position of the car to 11, which is about a third of the way across the screen.

Line 20 Sets the score to zero.

Line 30 Prints one obstacle at line 21, the bottom of the screen, and at a random position along that line. The obstacle is represented by three asterisks.

Line 40 Sets the print position at the same place as the position of the car. Before the car is printed to the screen, we must check to see that there is nothing already there. That will not happen the first time, but may happen later in the game.

Line 50 This line is one of the most useful programming devices for the ZX-81. It looks directly at the bytes 16398 and 16399 in the systems variable area of the memory, which you would not usually use. Those stores contain the address of the square on the screen where the computer is to print the next character. It then looks at that byte to see whether there is already something there, in this case code number 23, which is the code number of the asterisk. You can find the code numbers for characters in Appendix A of your ZX-81 manual. So taken together, lines 50 and 60 set the print position to where the car should be printed next, and then check to see if there is an asterisk already on the screen in that position.

If there is an asterisk there, then you have crashed, and the program jumps to line 120.

Line 60 Prints the car at the pre-arranged print position, which we now know to be clear of obstacles.

Line 70 Moves the whole display up one line, bringing the new obstacles closer to the car, and leaving room at the bottom for a new one. Any obstacles going off the top of the screen will be lost.

Lines 80-90 Check the keyboard to see which keys you are pressing. If you are pressing five or eight then the position of the car must change, and A is adjusted accordingly.

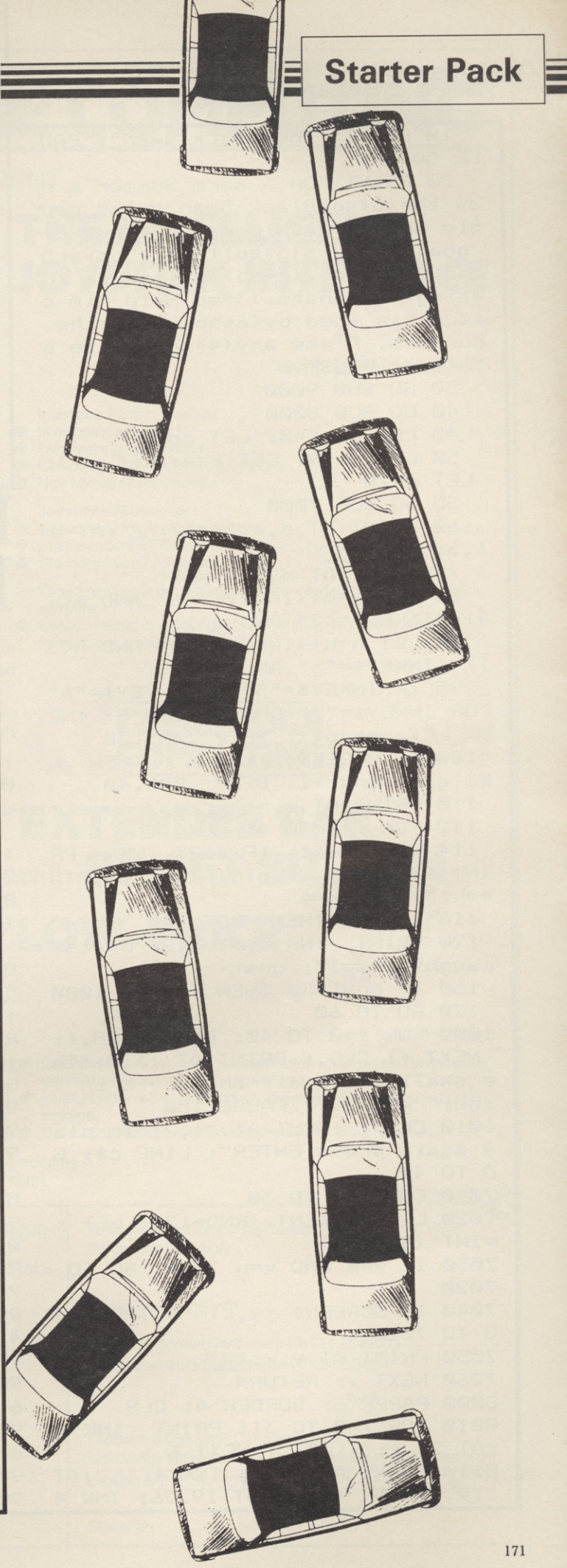
Line 100 Adds ten to your score.

Line 110 Sends you back to the beginning of the main part of the program.

Line 120 You have crashed so the computer prints out your score and then stops.

You could easily adapt the program, still in 1K, to make the game get harder as you play. One possible method would be to have a new variable, say A$, containing the obstacle, and change that each time the score reached a particular level.

```
  1 REM "DRIVER"
 10 LET A=11
 20 LET S=0
 30 PRINT AT 21,INT (RND*26);"*
**"
 40 PRINT AT 0,A;
 50 IF PEEK (PEEK 16398+256*PEE
K 16399)=23 THEN GOTO 120
 60 PRINT "■"
 70 SCROLL
 80 IF INKEY$="5" THEN LET A=A-
1
 90 IF INKEY$="8" THEN LET A=A+
1
100 LET S=S+10
110 GOTO 30
120 PRINT AT 0,0;S
```



BLACK SWAN

EXTREMELY effective use of the user defined graphics on the 16K Spectrum make this game by Michelle Presslie, of Dudley in the West Midlands, a pleasure to watch. You are a swallow who must eat as many gnats as possible in as short a time as you can, while below a black swan swims elegantly among the bulrushes.

The program uses our special abbreviations for graphics characters. Please read the instructions on the first page of Program Printout before typing in the program.

```
  10 PRINT "The Black swan": PAU
SE 50
  20 PRINT "On a warm Summer's d
ay the(6*sp)Black Swan swims gen
tly on his(2*sp)pond. A cloud of
 gnats hovers(3*sp)lazily  overh
ead. A hungry(6*sp)swallow is ch
asing the gnats.(3*sp)Help him c
atch his food by(6*sp)using the
cursors. Press any(4*sp)key to s
tart.": PAUSE 0
  30 GO SUB 9000
  40 GO SUB 8000
  45 LET gnat=0: LET go=0
  50 LET d=19: LET a=4: LET m=3:
 LET n=28
  55 GO SUB 7000
  60 PRINT AT d,a;"(sp)AB";AT d+
1,a;"(sp)CD"
  75 PRINT AT m,n;"(sp)"
  80 LET m=m+(INKEY$="6" AND m<1
4)-(INKEY$="7" AND m>1)
  90 LET n=n+(INKEY$="8" AND n<3
1)-(INKEY$="5" AND n>0)
  95 IF INKEY$="5" OR INKEY$="6"
 OR INKEY$="7" OR INKEY$="8" THE
N  LET go=go+1: BEEP .005,30
 100 IF SCREEN$ (m,n)="" THEN  L
ET gnat=gnat+1: BEEP .008,40
 110 PRINT AT m,n;"H"
 112 FOR i=1 TO 4: NEXT i
 114 LET a=a+1: IF a>23 THEN  PR
INT AT d,a;"(2*sp)";AT d+1,a;"(2
*sp)": LET a=4
 116 IF a<4 THEN  LET a=4
 120 PRINT  INK 2;AT 0,8;"Gnats
caught(2*sp)"; gnat
 160 IF gnat=30 THEN  GO TO 1000
 170 GO TO 60
1000 FOR f=0 TO 40: BEEP .008,f:
 NEXT f: CLS : PRINT AT 11,0;"Th
e swallow ate all the gnats in "
;go;" swoops": PAUSE 150
1010 CLS : INPUT AT 11,2;"To pla
y again press ENTER"; LINE c$: G
O TO 40
7010 FOR i=1 TO 30
7020 LET y=2+INT (RND*12): LET x
=INT (RND*31)
7030 IF y=m AND x=n THEN  GO TO
7020
7040 IF SCREEN$ (y,x)="" THEN  G
O TO 7020
7050 PRINT AT y,x;"E"
7060 NEXT i: RETURN
8000 PAPER 6: BORDER 4: CLS
8010 FOR f=0 TO 31: PRINT  INK 5
;AT 21,f;"(ig8)": NEXT f
8110 PRINT AT 19,1; INK 4;"E";AT
 19,3; INK 4;"E";AT 19,26; INK 4
;"E";AT 19,28; INK 4;"E";AT 19,3
0; INK 4;"E"
8120 PRINT AT 20,1; INK 4;"E";AT
 20,3; INK 4;"E";AT 20,26; INK 4
;"E";AT 20,28; INK 4;"E";AT 20,3
0; INK 4;"E"
8130 PRINT AT 18,1;"G";AT 18,3;
INK 4;"E";AT 18,26;"E";AT 18,28;
 INK 4;"E";AT 18,30; INK 4;"E"
8140 PRINT AT 17,3;"G";AT 17,26;
"G";AT 17,28; INK 4;"E";AT 17,30
; INK 4;"E"
8150 PRINT AT 16,28;"G";AT 16,30
; INK 4;"E"
8160 PRINT AT 15,30;"G"
8200 RETURN
9000 FOR n=USR "a" TO USR "h"+7
9010 READ v: POKE n,v: NEXT n
9020 DATA 0,0,224,112,60,62,31,1
5
9030 DATA 0,48,120,104,124,102,4
8,56
9040 DATA 7,231,55,31,143,255,12
7,63
9050 DATA 204,238,255,255,255,25
4,252,248
9060 DATA 0,0,20,8,0,0,0,0
9065 DATA 16,16,16,16,16,16,16,1
6
9070 DATA 16,56,56,56,56,56,56,1
6
9080 DATA 1,5,106,220,60,2,1,0
9090 RETURN
```

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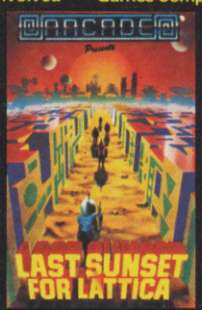

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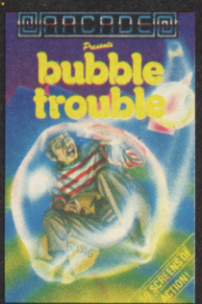

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An object lesson for adventurers

Quentin Heath describes a simple system for creating complex adventures

ARTIFICIALLY intelligent characters can add atmosphere to any adventure game, but the most important parts remain the scenario and the objects it contains.

The most popular means of programming a scenario is to use a grid, first plotted on paper and then transferred to the computer either as a compact data block within a machine code program or an array within a Basic program. Such a

	1	2	3
A			
B	1000 1030 1060	2000 0 0	
C			

Figure 1. Argolian grid.

structure is shown in figure one which is the floor plan of an Argolian monastery. each of the squares represents one move and the scale could be adjusted to make it one room or part of a room.

The floorplan in figure one does not contain any information about the locations. Instead it contains a list of numbers. These values are address pointers to various other lists which describe locations and events within them. In figure one, for instance, location B1 lists a series of numbers which in themselves mean nothing. To the adventure control program, however, each number has a meaning and they are:

room description = 1000
monster description = 1030
object description = 1060

When the program's movement routine places a player at room B1 in the monastery it needs a long location description in order to inform the player what is going on. It finds the number 1000 in that position on the list and then goes to the memory address where the room description is stored. When it has found it the program gives the information in figure two to the player.

The next action of the program, is to see if any objects are stored within the room. The object description for room B1 is placed at memory location 1060 and printed out after a location description. In the example the object is a small glass egg and the program would produce the printout shown in figure three.

If no object has been stored in a particular location the address indicator in the grid for 'object description' should contain a value which tells the program not to look for an object. The program may also change the value if an object is removed during play.

Using the grid system the task of programming a game is made easier because the program only needs to manipulate the grid of memory references and not the lists of descriptions.

The grid in the example is simple and more factors can, and should, be added to it. For instance, the fighting abilities of a monster who is known to haunt a room could be included in a list indicated by the location grid.

address	room	monster	object
1000	dark room		
1030		Smike	
1060			crystal egg
2000	chapel		
0			
0			

Figure 2.

These numbers, discussed last month in *Mind Games,* could be compared to player strengths and weaknesses when a fight takes place and changed as the monster wins or loses. If death occurs a zero can be placed in the reference grid.

The monastery shown in the example grid has only one level. It is, however, easy to develop a grid in which you can move to different floors.

Grids should be created as if they were being produced for a one level adventure but with one important difference. A new reference is added to the list for each location which indicates whether there is a staircase in the room and in which direction, up or down, it goes. The grids are laid end to end in memory.

All the computer needs to do is look at the indicators on the list. If they are set to any number except zero there is a staircase in the room. The player is then asked whether a transition from one floor to another is required. If so, the program then switches to a different floor.

The example, which uses absolute RAM memory addresses, is for a machine code adventure program but by creating a series of arrays, one for each grid and one for each list of information, the grid reference system can be used within a Basic adventure program. The machine code addresses are translated into array elements and a three dimensional array can store any number of grids.

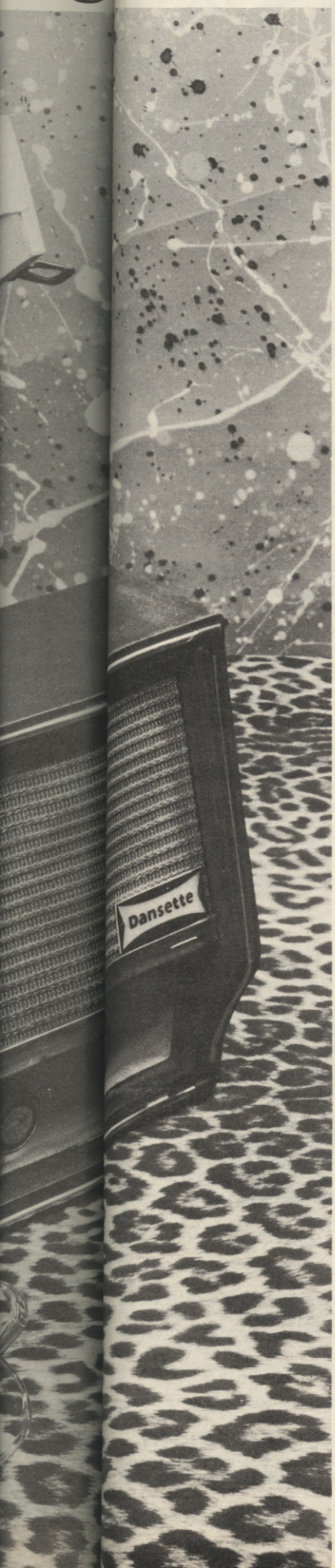
The grid reference system is simple to use and, with the techniques described in previous articles about character generation and manipulation, should enable a substantial artificially intelligent adventure game to be written.

Your are standing in a **DARK** room.
There is a **CRYSTAL EGG** in the room which is guarded by a **SMIKE.**

Figure 3.

Amazing how played out some thing

ingecome.



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Moving displays in black and white

Andrew Hewson looks at the position of the ZX-81 screen display and shows how to produce headerless files on the Spectrum

I HAVE NOTICED a decrease in the number of questions from ZX-81 owners in the past year and so I have tended to concentrate on the Spectrum. This month I redress the balance.

The first question, from Mr Dave Harris of Abingdon, introduces the theme: **Can you explain the ZX-81 display file?"**

The area at the bottom of RAM between 16384 and 16508 holds the system variables and is followed by the program area, starting at 16509. The display file is next but as programs can vary in length, the display file does not start at a fixed address. The ZX-81 keeps track of it by storing the current value of the starting address in D-FILE.

If you look at page 178 of the manual you will see that the value of D-FILE is stored at address 16396 and so you might infer that you have only to look at the contents of 16396 to find the value of D-FILE.

Unfortunately, that is not true. Remember that the value of D-FILE is an address and that addresses are whole numbers, like 16384 and 17407 and 32767. A single location can only hold a number between 0 and 255 and so two adjacent locations are used to store large numbers. The value of D-FILE is given by: value in 16396 + 256*value in 16397. Any whole number between 0 and 65535 inclusive can be stored using that system. The value held at an address can be found by PEEKing at it and so you can PRINT the value of D-FILE by entering:

```
PRINT PEEK 16396 + 256*PEEK 16397
```

You may know that the contents of the first location in the display file is always 118 and you can show that by entering:

```
PRINT PEEK (PEEK 16396 + 256*PEEK 16397)
```

Similarly, the address of the end of the display is held in VARS — or more correctly is one less than the value in VARS — and can be PRINTed by entering:

```
PRINT PEEK 16400 + 256*PEEK 16401-1
```

Each line displayed on the screen is teminated by a byte containing decimal 118 and there is one more byte at the beginning of the file also containing 118. As there are 24 lines in the display, there are 25 bytes containing 118 and it is essential to the correct functioning of the display software that all 25 bytes are present.

With an unexpanded ZX-81 the display file consists of those 25 bytes and no more unless a LIST, PRINT or PLOT command has been executed since the last CLS or RUN command. That is a device to keep the display file as small as possible.

With a memory expansion pack of 4K or more the ZX-81 pads-out the display file with 32 bytes per line each containing zero — i.e., blanks.

Mark Wilson of Aberdeen writes:

"Could you please tell me how to scroll the ZX-81 screen up, down, left and right?"

To scroll the screen downwards or from side to side it is necessary to rearrange the contents of the display file in the appropriate logical fashion. There is one rule which must be obeyed whilst such rearrangements are in progress. It is that whilst running in SLOW mode the ZX-81 display file must contain at least 25 bytes holding 118 at all times. If that rule is broken the consequences are dire — the machine crashes and the only remedy is to pull out the plug and start again.

Tables 1 and 2 consist of programs to scroll the display from side to side and downwards respectively. A few simple alterations as shown to the program in table 1 will change the direction of scrolling from right to left to left to right as required. Similar changes could be made to the program in table 2 to scroll the screen upwards but I have not shown them because it is easier to use the SCROLL command.

The first program works as follows. Variables A and B are set to the values of D-FILE and VARS less one, that is to the addresses of the beginning and end of the display file respectively. Then each location in the display file is inspected in turn using variable I. If it does not contain 118 then the value in it is POKEd into the location to the left or

continued on page 182

```
100  LET A=PEEK 16396+256*
     PEEK 16397
110  LET B=PEEK 16400+256*
     PEEK 16401-1
120  LET D=1
130  LET I=B
150  LET S=PEEK I
160  LET I=I-D
170  IF PEEK I=118 THEN GOTO
     200
180  POKE I+D,PEEK I
190  GOTO 160
200  POKE I+D,S
210  IF I=A THEN STOP
220  LET I=I-D
230  GOTO150
```

Table 1. A program to scroll the ZX-81 display from left to right. To scroll from right to left alter lines 120, 130 and 210 as follows:

```
120  LET D=-1
130  LET I=A
210  IF I=B THEN  STOP
```

continued from page 181

to the right — depending on the value set for D in line 120 — and the routine loops to line 160 to inspect the next location.

If a location contains 118 the value from the beginning of the line — stored in variable — is POKEd into the adjacent location. That is the way in which a wraparound effect is achieved. A test is then made — line 210 — to see if the job is completed. The second program works in an analogous fashion.

Adrian Neilson of Dedridge, West Lothian writes: **"Please explain how to get a scan going across the screen which makes up a picture and the name of the game and then fills in with colour".**

The technique is very straight forward and is explained in the Spectrum Manual but I have received several letters on the topic. The current Spectrum display can be SAVEd at any time using either of the commands:

SAVE "name" SCREEN$

or

SAVE "name" CODE 16384,6912

The display can be LOADed by entering any of the following:

LOAD "name" SCREEN$
LOAD "name" CODE 16384,6912
LOAD "name" CODE

A particular problem with SAVEing and LOADing the screen is that the various commands and messages are also displayed on the screen. In doing so they prevent the programmer from having full flexibility in the way in which he constructs his display.

A way around the problem is to reserve space RAMTOP for a copy of the display by entering

CLEAR 58623

and to use the area to maintain a copy of the required display. A display which is SAVEd from the upper area will automatically LOAD into the display file if the SCREEN$ qualifier is used, i.e. the following pair of instructions are mutually compatible:

SAVE "name" CODE 58623,6912
LOAD "name" SCREEN$

Lindsey Round of Chessington, Surrey has written to say: **"How do you create headerless files and save and load them on the Spectrum?"**

In normal operation all Spectrum cassette files are SAVEd and LOADed in two parts. The first part is very short and specifies the name, type, length, and so on of the main part of the file. On reading the header the Spectrum checks that the name and type match that which it is looking for and displays them on the screen. The remaining data are used by the main loading routine so that it knows where to place the incoming data and how much there will be of it.

The main saving and loading routines in ROM can be called directly from a machine code routine provided the correct parameters are passed in the appropriate Z80 registers. In that way headerless files may be written and read to and from cassette.

Table 3 lists the various parameters and their interpretations and table 4 lists two routines which SAVE and LOAD the screen in that fashion. The routines can be loaded into the Spectrum using an assembler or using the simple decimal loader listed in table 5.

● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

```
100  LET A=PEEK 16396+256*PEEK 16397
110  LET B=PEEK 16400+256*PEEK 16401-1
120  LET C=I
130  IF PEEK (B-C)=118 THEN GOTO 160
140  LET C=C+1
150  GOTO 130
160  FAST
170  FOR I=B-1 TO A+C STEP -1
180  POKE I,PEEK (I-C)
190  NEXT I
200  FOR I=A+1 TO A+C-1
210  POKE I,0
220  NEXT I
```

Table 2. A program to scroll the ZX-81 display downwards.

	To Save	To Load
Carry flag status	Clear	Set
A register contents	255 (ffh)	255 (ffh)
IX register contents	Address to SAVE from	Address to LOAD to
DE register contents	Number of bytes to SAVE	Number of bytes to LOAD
Address of ROM routine	1218 (04c2h)	1366 (0556h)

Table 3. Parameters of Spectrum routines to SAVE and LOAD headerless files.

Decimal	Assembler	Comment
167	AND A	Clear carry
62 255	LD A,255	Load A with 255
221 33 0 64	LD IX,16384	SAVE from 16384
17 48 24	LD DE,6192	Length 6192
205 194 4	CALL 1218	Call SAVE routine
201	RET	Return
55	SCF	Set carry
62 255	LD A,255	Load A with 255
221 33 0 64	LD IX,16384	LOAD 16384
17 48 24	LD DE,6192	Length 6192
205 86 5	CALL 1366	Call LOAD routine
201	RET	Return

Table 4. Two Spectrum routines to SAVE and LOAD the screen display to and from a headerless file.

```
10  LET I=23296
20  INPUT J
30  POKE I,J
40  PRINT I, PEEK I
50  GOTO 20
```

Table 5. A simple Spectrum program for loading decimal code into the printer buffer. When used to store the routine in Table 4 the routines can be called at addresses 23296 and 23310.

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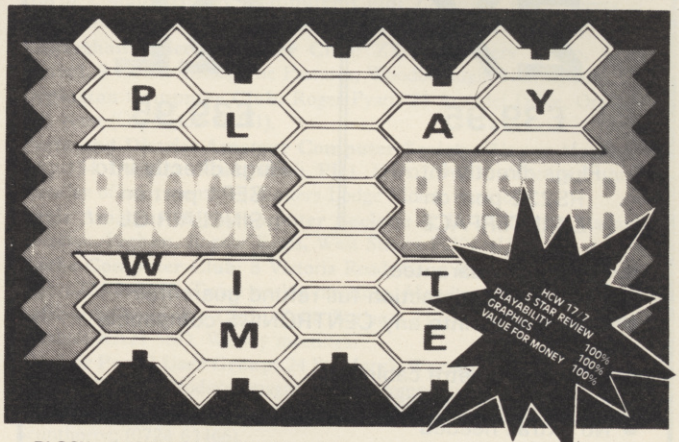

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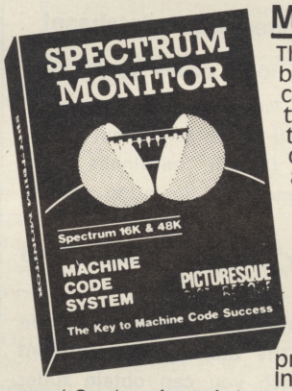

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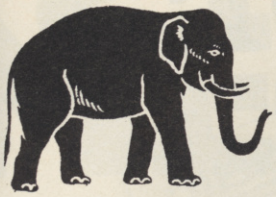

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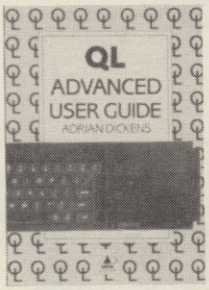

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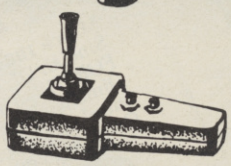

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Beginners Guide for New Users
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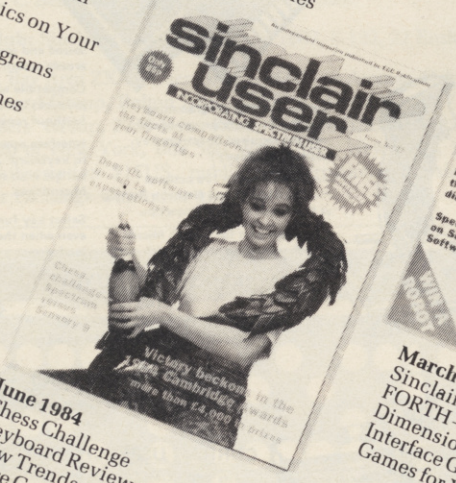

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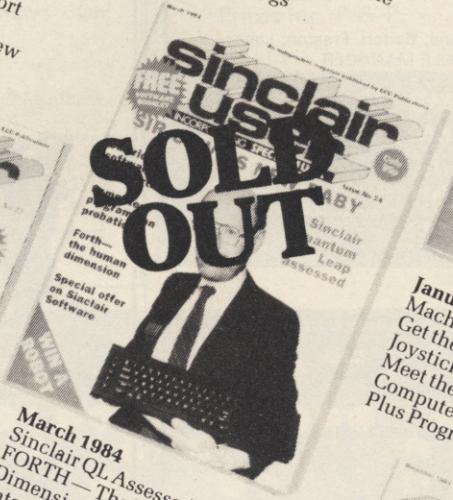

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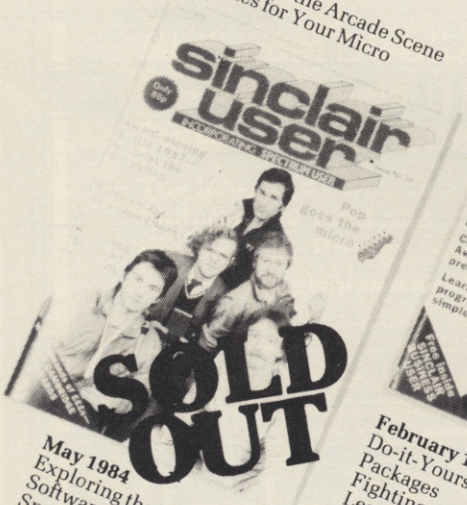

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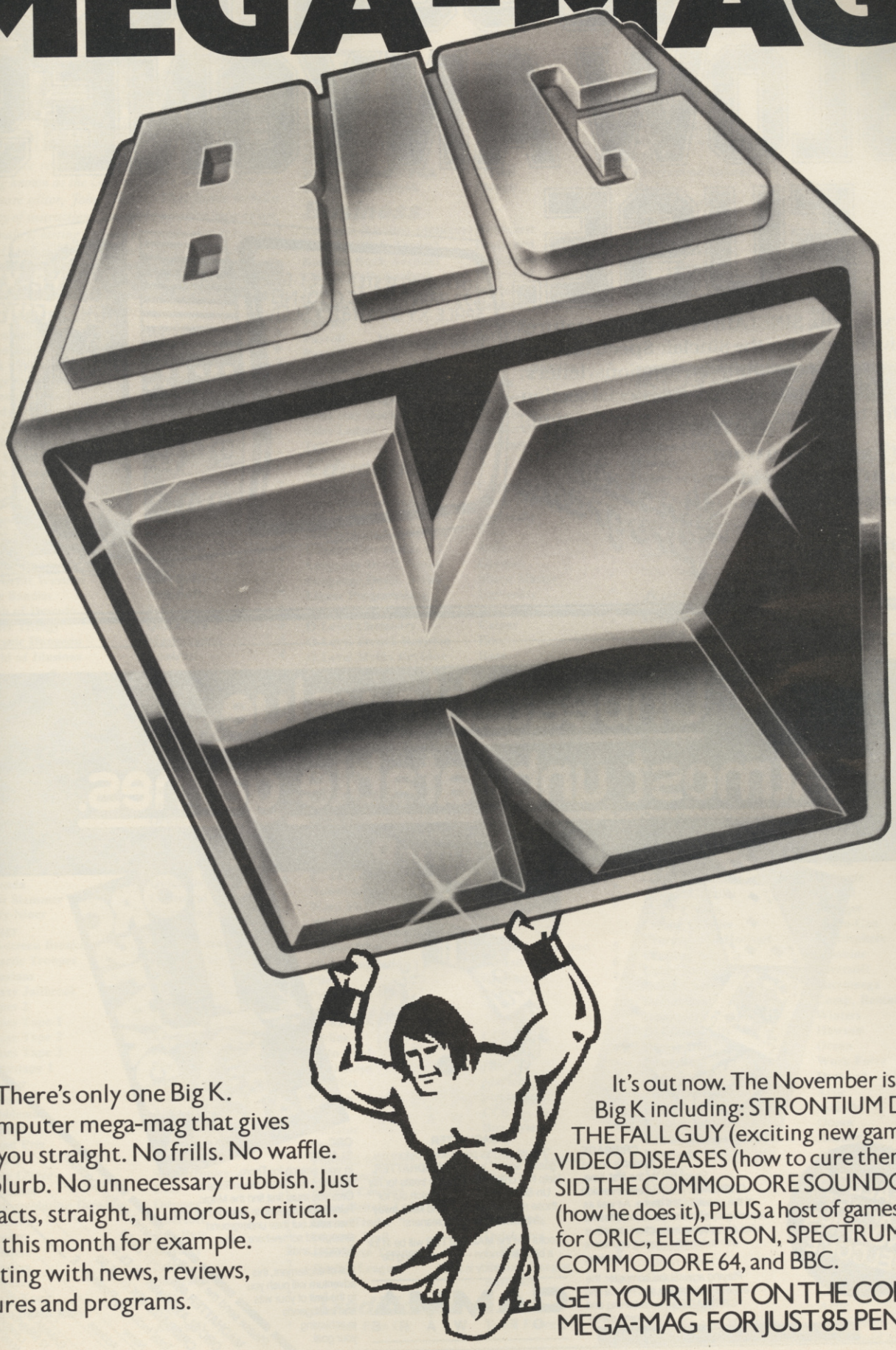

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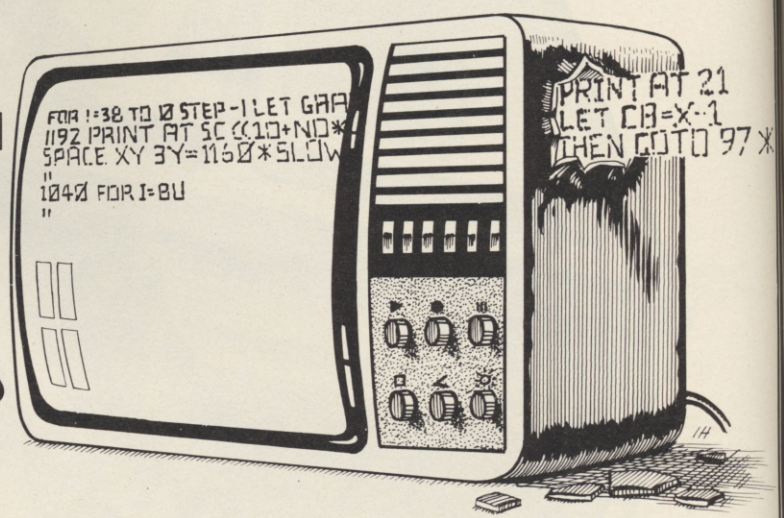

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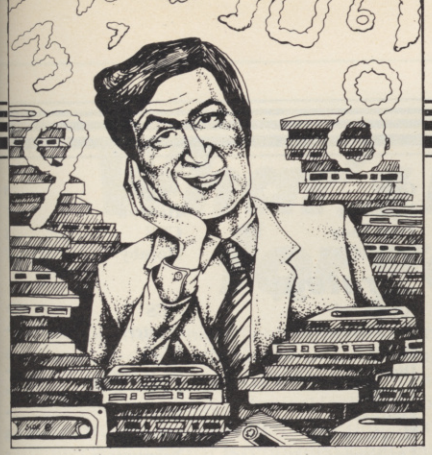

Software Directory

If we have reviewed a program we have given it a rating known as the Gilbert Factor, named after our Software editor, John Gilbert. That factor includes clarity of instructions, speed of operation, ease of use, originality, lasting appeal, use made of graphics and sound, and success in accomplishing stated aims.

ZX-81

Adventure

Adventure	Bug-Byte	6
Adventure 1	Abersoft	6
Black Crystal	Mastervision	7
Dungeons of Doom	Woosoft	*
Espionage Island	Artic	*
Greedy Gulch	Phipps	7
Inca Curse	Sinclair	*
Knight's Quest	Phipps	*
Lost Island	JRS	*
Magic Mountain	Phipps	*
Merchant of Venus	Crystal	7
Pharoah's Tomb	Phipps	*
Pimania	Automata	6
Secret Valley	Newsoft	*
Serpents Tomb	Vortex	*
Ship of Doom	Artic	7
The Great Western	New Soft	*
Time Bandits	New Soft	*
Tomb of Dracula	Felix	*
Trader Trilogy	Quicksilva	6
Volcanic Dungeon	Mastervision	5
World of Illusions	Contrast	4

Arcade

Alien Dropout	Silversoft	*
Asteroids	Silversoft	8
Asteroids	Software Farm	6
Astral Convoy	Vortex	*
Bank Robber	Romik	6
Bears in the Wood	Unicorn	6
Bubble Bugs	Romik	6
Byter	Protek	*
Cassette 1	Orwin	7
Cassette 2-5	Orwin	7
City Patrol	Sinclair	7
Damper	Quicksilva	7
Defenda	Quicksilva	8
Door Slammer	Cathedral	7
Forty-Niner	Software Farm	9
Froggy	DJL	7
Full-screen Breakout	New Generation	*
Galactic Trooper	Romik	6
Galaxians	Quicksilva	6
Galaxy Jailbreak	Romik	6
Games 2	JRS	*
Games Tape 1	J K Greye	*
Games Tape 2	J K Greye	*
Games Tape 3	J K Greye	*
Gamestape 1	Fawkes Computing	7
Glooper	Quicksilva	7
Gloops	Quicksilva	5
Gobbleman	Artic	*
Gobbler	Software Farm	*
Grand Prix	dk'tronics	*
Gulp 2	Campbell	*
Hang Glider	S Electronics	6
Hickstead	CCS	5
High-resolution Invaders	Odyssey	*
Invaders	Abersoft	*
Invaders	Bug-Byte	5
Invaders	Odyssey	8
Invaders	Selec	7
Invaders	Silversoft	*
Krazy Kong	PSS	*
Maze Death Race	PSS	*
Maze Man	Abersoft	*
Mazogs	Bug-Byte	8
Micro Mouse	Lothlorien	7
Namtir Raiders	Artic	8
Night Gunner	Digital Integration	5
Puckman	Hewson	*
Sabotage	Sinclair	6
Six Games	A Stubbs	5
Space Raiders	Sinclair	*
Space Trek	JRS	*
3D Monster Maze	New Generation	9
Three Games Cassette	McGraw Hill	8
Zuckman	DJL	8
ZX Invasion Force	Artic	*
ZX Panic	Selec	4
ZX-81 1K Games Pack	Crystal	9
ZX-81 Pocket Book	Phipps	*

Business

Accounts (Limited company)	Hestacrest	*
Accounts (Sole Trader)	Hestacrest	*
Business Bank Account	Transform	*
Critical Path Analysis	Hilderbay	6
Draft	Myrmidon	*
Mailing List	Hestacrest	*
Payroll	Hilderbay	*
Payroll	Soft Tech	*
Payroll	Soft Tech	*
Payroll	V&H Computing	*
Personal Banking System	Hilton	*
Purchase Ledger	Hestacrest	*
Sales Day Book	Transform	*
Sales Ledger	Hestacrest	*
Text	Contrast	8

Education

Calpac 1-2	Calpac	*
Four Rules of Number	Micro Master	*
Integration	University	8
Intermediate English 1-2	Rose	*
Intermediate Maths 1-2	Rose	*
Language Devel. Series	Glasson	*
Language Devel. Series	Micro Master	*
Linear Programming	University	*
Matrix Operations	University	7
O Level Chemistry	Calpac	*
O Level French Revision	Rose	*
O Level Maths Revision	Rose	*
Polynomials	University	*
Primary Arithmetic	Rose	*
Regression	University	*
Self-teach Program	Anvil	*

Language

Forth	Sinclair	7
ZX Forth	Artic	8

Practical

Ephemeris	Bridge	7
Football Pools	Hartland	*
Poolster	Naigram	3

Puzzle

Nowotnik Puzzle	Phipps	*
Word Fit	Ram Writer	6

Simulation

Fighter Pilot	Digital Integration	5
Flight Simulation	Sinclair	6
Pilot	Hewson	7
Print Shop	CCS	*

Strategy

Airline	CCS	7
Auto Chef	CCS	7
Battleships	JRS	*
Conflict	Martech	7
Cyborg Wars	Stratagem	7
Dallas	CCS	6
Dictator	Bug-Byte	7
Farmer	CCS	*
Football Manager	Addictive Games	7
Fort Apache	Contrast	8
Galaxy Conflict	Martech	8
Great Britain Ltd	Hessel	*
Ocean Trader	Quicksilva	7
Pioneer Trail	Quicksilva	7
Racehorse Trainer	G Barker	6
Racing League	Racing League Software	4

Traditional

Do Not Pass Go	Work Force	*
Lynchmob	Bridge	6
Original Superchess	CP Software	*
Tai	PSS	*
Tenpin	Phipps	*
ZX 1K Chess	Artic	*
ZX Compendium	Mastervision	7
ZX-Chess I	Artic	*

Utility

Graphics	IPA	*
Graphics Toolkit	JRS	9
HI Resolution	CRL	6
Machine Code Test Tool	OCP	*
MCoder	PSS	8
Programme Enhancement Package	R and R	*
Renumber Delete	Work Force	*
Trace	Texgate	7
ZX Compiler	Silversoft	*
ZX Screenkit	Picturesque	*
ZX-81 Remload	Picturesque	*
ZX-Bug	Artic	*
ZX-sideprint	Microsphere	*
ZXAS	Bug-Byte	*
ZXDB	Bug-Byte	*

SPECTRUM 16K

Adventure

Android One	Vortex	*
Escape	New Generation	8
Mines of Saturn/Return to Earth	Mikro-Gen	*
Moria	Severn	*
Planet of Death	Artic	6
Secret Valley	New Soft	*
The Great Western	New Soft	*
Time Bandits	New Soft	*

Arcade

Aquarius	Bug-Byte	6
Arcadia	Beau Jolly	5
Arcadian	J K Greye	6
Assassin	Spectrasoft	*
Avenger	Abacus	5
Baron	Temptation	*
Base Invaders	Imagination	*
Black Hole	Quest	6
Blind Alley	Sunshine	7
Bug Blaster	Crystal	*
Cassette A	Orwin	*
Caterpillar	CDS	*
Cavern Fighter	Bug-Byte	4
Centi-Bug	dk'tronics	*
Children's Compendium	Dymond	*
City Defence	Mikro-Gen	*
Colour Clash	Romik	4
Cookie	Ultimate	*
Cosmic Guerilla	Crystal	8
Crazy Cranes	Voyager	5
Creepy Crawler	Mikro-Gen	*
Crevasse and Hotfoot	Microsphere	7
Cruising	Sunshine	4
Cyber Rats	Silversoft	7
Death Chase	Micromega	6
Demolition	Comp. Rentals	*
Destroyer	Winters	*
Di-lithium Lift	Hewson	3
Digger Dan	Ocean	*
Doombugs	Work Force	8
Dymonoids	Dymond	*
Earth Defence	Artic	5
Ed-On	Add-On	4
Eskimo Eddie	Ocean	*
Family Games Pack	Hornby	*
Fireflash	Abacus	5
Froggy	DJL	7
Fruit Machine	dk'tronics	6
Galactians	dk'tronics	*
Galactic Trooper	Romik	3
Galactic Warriors	Abacus	6
Galaxians	Artic	6
Ghost Hunt	PSS	*
Gnasher	Mastertronic	4
Gobble-a-Ghost	CDS	*
Gobbleman	Artic	*
Godzilla and Martians	Temptation	7

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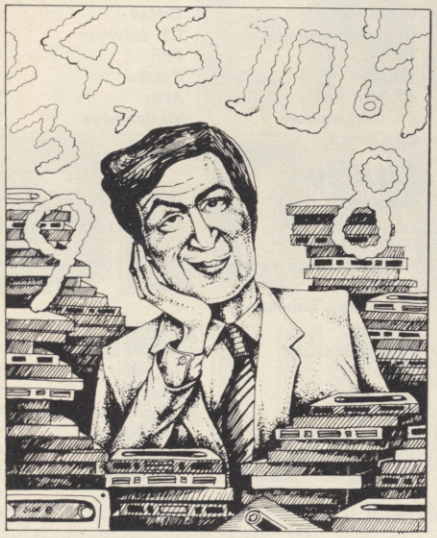

Ground Attack	Silversoft	6
Gulpman	Campbell	*
Haunted Hedges	Micromega	6
Hopper	PSS	6
Horace and the Spiders	Sinclair	8
Horace Goes Skiing	Sinclair	8
Hungry Horace	Sinclair	8
Invasion Force	Artic	8
It's the Wooluf	Crystal	5
Jet Pac	Ultimate	8
Labyrinth	Axis	4
Leap Frog	CDS	*
Light Cycle	PSS	*
Luna Crabs	Micromega	7
Magic Meanies	CDS	2
Maze Chase	Hewson	8
Meteor Storm	Quicksilva	7
Meteoroids	dk'tronics	7
Meteoroids	Softek	6
Micro Mouse	Lothlorien	6
Millypede	Add-on	7
Mined Out	Quicksilva	7
Moon Buggy	Visions	6
Mr Wong's Loopy Laundry	Artic	6
Muncher	Silversoft	*
Muncher	Silversoft	6
Nanas	Mikro-Gen	*
Orbiter	Silversoft	7
Ostron	Softek	*
Pengy	Micromania	4
Pitman Seven	Visions	*
Planetoids	Sinclair	8
Proteus	Abacus	5
Rapedes	Visions	*
Repulsar	Softek	*
Rider	Virgin	6
Road Toad	dk'tronics	7
Robot Panic	Soft Mill	1
Sam Spade	Silversoft	5
Santa	Artic	*
Sentinel	Abacus	7
Shark Attack	Romik	5
Sheer Panic	Visions	7
Slippery Sid	Silversoft	8
Space Fighter	Winters	*
Space Intruders	Quicksilva	7
Space Lanes	Cathedral	*
Space Raiders	Sinclair	6
Space Zombies	Mikro-Gen	*
Spec. Frogs/ Showdown	Artic	*
Spec. Gobbleman	Artic	*
Spec. Invaders	Artic	*
Spec. Invasion Force	Artic	*
Spec. Scramble	Work Force	7
Spectipede	Mastertronic	5
Spectral Invaders	Bug-Byte	8
Spectral Panic	Hewson	5
Spectres	Bug-Byte	6
Strike Four	Spectresoft	4
Styx	Bug-Byte	7
Sub	Romik	*
Tank Battle	dk'tronics	8
3D Monster Chase	Romik	3
Train Game	Microsphere	9
Trom	dk'tronics	4
Vortex	JK Greye	5
Winged Warlord	CDS	6
Wizard's Warriors	Abersoft	*
Yomp	Virgin	7

Business

Finance Manager	OCP	9
Home Computer Pack	SD Micro	*
Masterfile 16	Campbell	*
Matcalc	Work Force	*
Micropen	Contrast	*
Vu-Calc	Sinclair	7
Vu-File	Sinclair	8

Education

Alphabet	Widget	*
Alphabet Games	Sinclair	*
Apostrophe	Sinclair	7
Ballooning	Heinemann	*
Calpac 1-3	Calpac	*
Car Journey	Heinemann	*
Cargo	Sinclair	*
Chess Tutor	Artic	7
Counting	Starter Soft	*
Counting	Widget	*
Education One	Lerm	*
Educational	Startersoft	*
Firework Music	Soft Cottage	8
First Numbers	Collins	*
40 Education Games	Granada	*
Four Rules of Number	Micro Master	*
French Voc Test	Tutorial	*
Hidden Letters	Poppy	*
Hot Dot Spotter	Longman	*
Integration	University	8
Intermediate English 1-2	Rose	*
Intermediate Maths 1-2	Rose	*
Know Your Tables	Collins	*
Language Devel. Series	Glasson	*
Language Devel. Series	Micro Master	*
Learn Basic	Logic 3	*
Learning Read 1	Poppy	*
Linear Programming	University	*
Marks Book	Lerm	*
Maths Invaders	Stell	*
Maths Tutor	AD Software	*
Matrix Operations	University	7
Money	Poppy	*
Night Sky	Bridge	*
O Level Maths	Homestudy	*
O Level Physics	Homestudy	*
Paddington's Shopping Mix-up	Collins	*
Pathfinder	Widget	*
Polynomials	University	8
Pre/early school cassettes	Essex	*
Primary Arithmetic	Rose	*
Punctuation Pete	Heinemann	*
Regression	University	8
Self-teach Program	Anvil	*
Shape Sorter	Widget	*
Special Agent	Heinemann	*
Spellbin	Startersoft	*
Use and Learn	Microl	8

Language

Beta Basic	Betasoft	9

Practical

Biorythms	Spectrasoft	*
Countries of the World	Hewson	8
Cycle Planner	Medidata	4
Map of the UK	Kuma	7
Shopping List	SD	*
Spectasort	Spectadraw	4

Puzzle

Flippit	Sinclair	7
Hanoi King	Contrast	7
Lojix	Virgin	3
Nowotnik Puzzle	Phipps	7
Quazar	Rose	4

Simulation

Air Traffic Controller	Hewson	6
Airliner	Protek	6
Golf	R & R	7
Golf	Virgin	7
Golf	Virgin	8
NightFlite	Hewson	5
Print Shop	CCS	8
Pro-Golf	Hornby	7

Strategy

Auto Chef	CCS	*
Big Match Soccer	Winters	*
Dallas	CCS	6
Dictator	dk'tronics	*
Farmer	CCS	*
Football	Winters	*
Heathrow	Hewson	8
Las Vegas	Temptation	*
Quincy	Severn	*

Traditional

Backgammon	Hewson	*
Bridge Tutor	CP Software	8
Bridgemaster	Bridgemaster	9
Challenge	Temptation	*
Gambling Tape	Dymond	*
Las Vegas	Temptation	5
Odds-on	RSD	*
Othello	CP Software	*
Pinball	Winters	*
Pool	Bug-Byte	7
Reversi	Sinclair	8
Roulette	Newsoft	*
Solo Whist	Video Soft.	*
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SPECTRUM 48K

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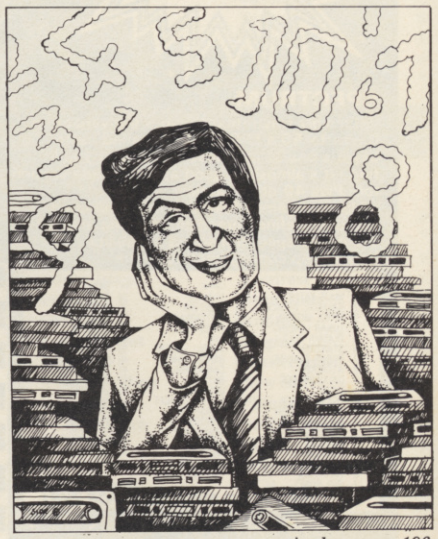

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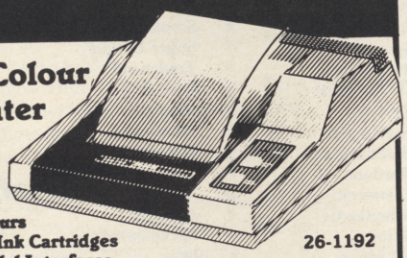

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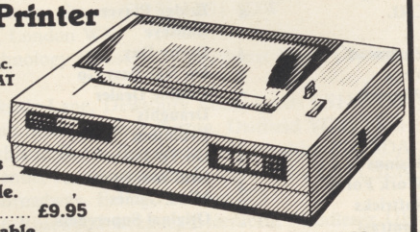

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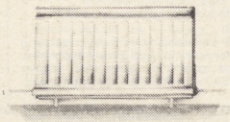

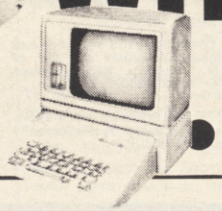

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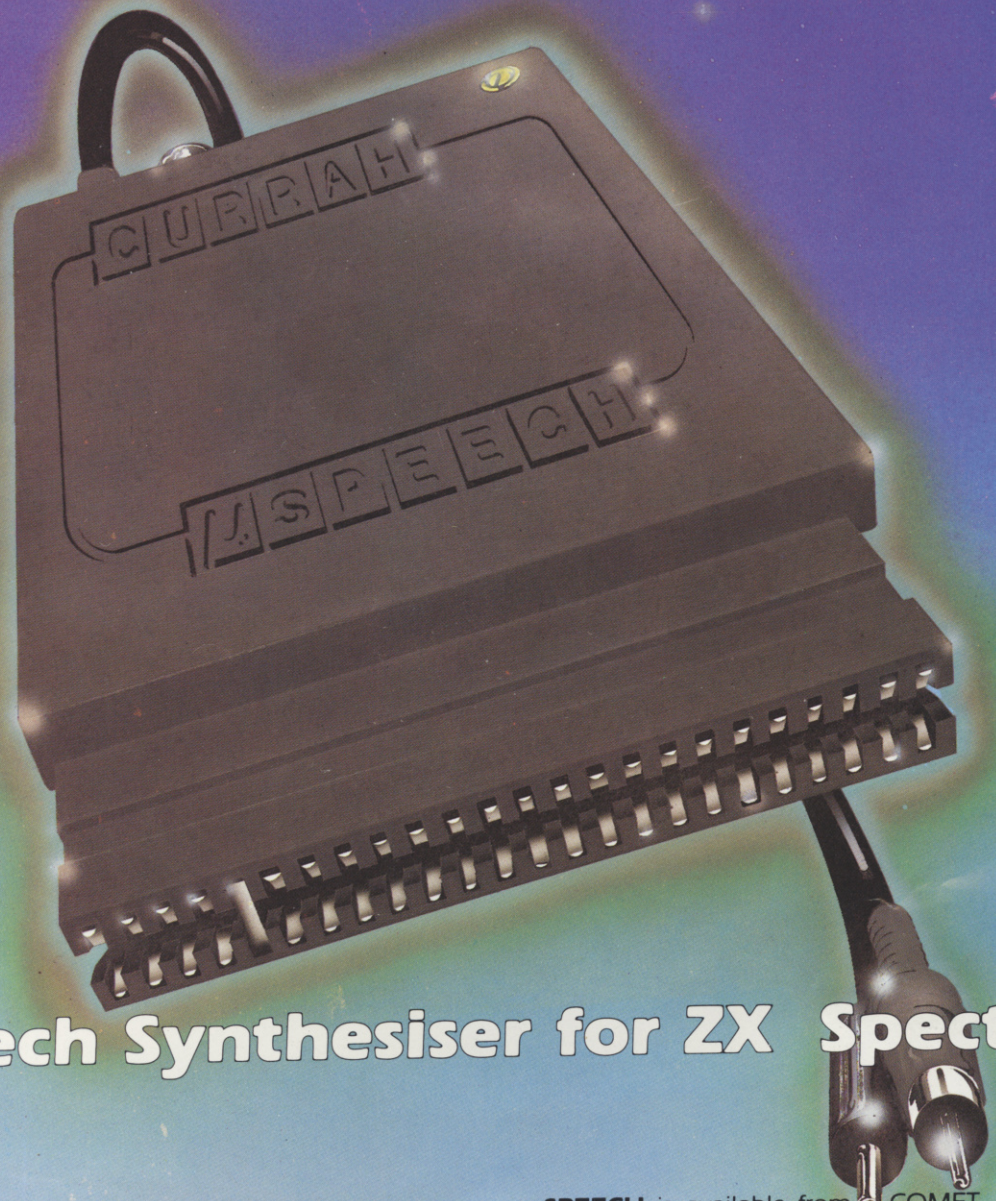

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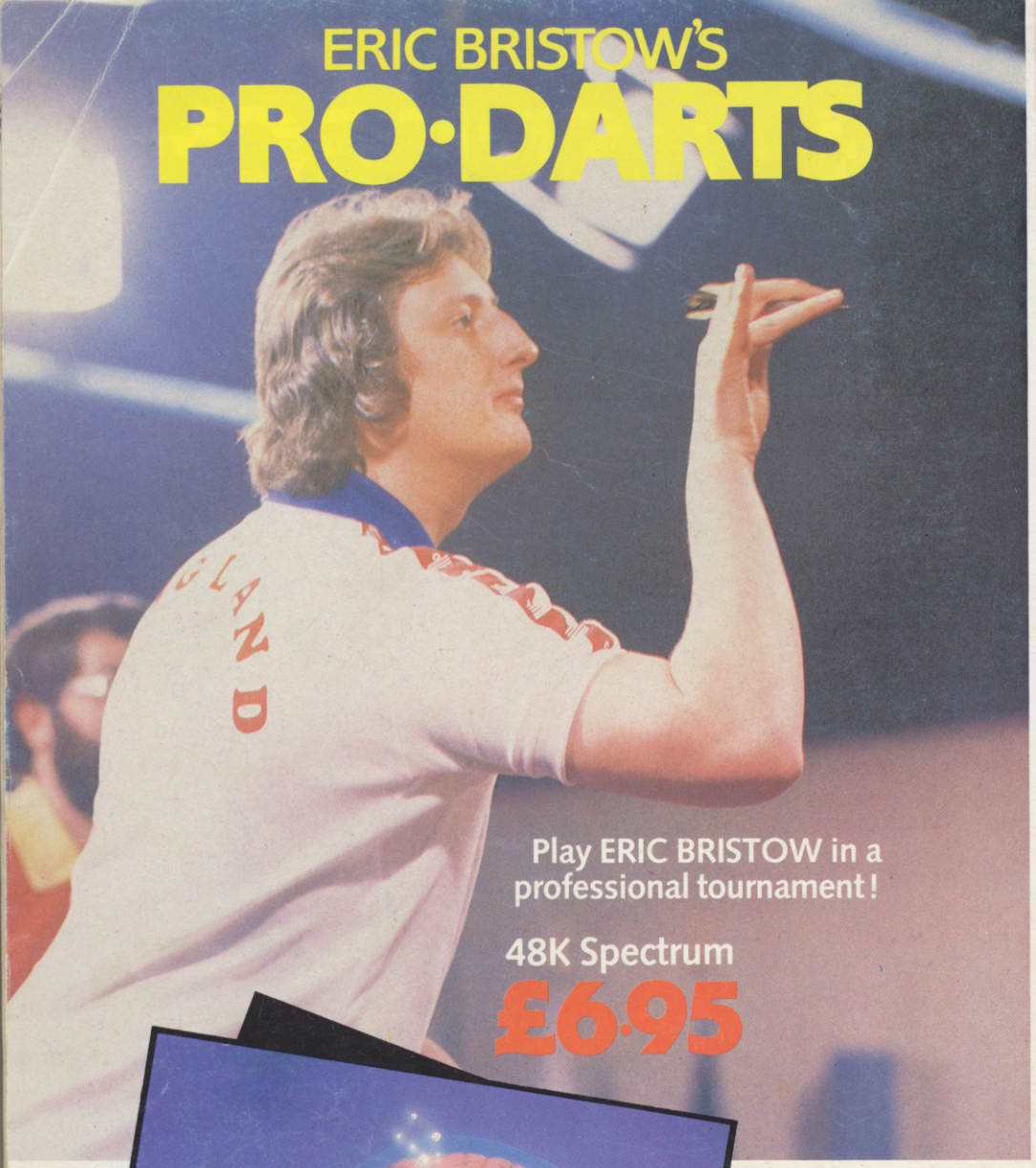

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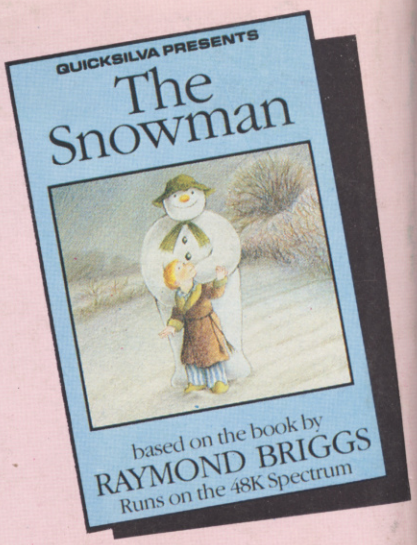

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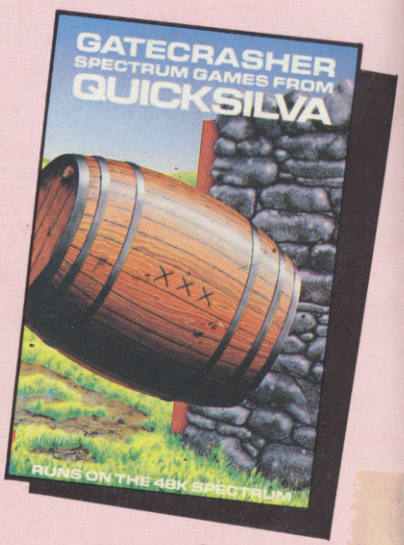

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